THE

AMERICAN REVIEW OF TUBERCULOSIS
ABSTRACTS OF TUBERCULOSIS

VOLUME XVIII JULY, 1928 ABST. No. 1

CONTENTS

	PAGES
Treatment (*continued*)	1–39
Tuberculin (concluded)	1–2
Surgical (Artificial Pneumothorax, Thoracoplasty, Phrenicotomy)	2–25
Actinotherapy (Heliotherapy, Ultraviolet, X-Ray)	25–30
Chemotherapy (Gold, Sanocrysin, Antimony, Calcium)	30–36
Miscellaneous	36–39
Prognosis	39–40

Treatment of Pulmonary Tuberculosis with Autogenous Vaccines.—Mixed autogenous vaccines were used for treating 18 cases of chronic tuberculosis with mixed infection, according to the method of Becker. In only 4 of these cases was there any improvement that might possibly be referred to the treatment. In no case was there a qualitative or quantitative improvement in the sputum findings. The method is not considered as an especially valuable adjunct to the ordinary therapeutic procedures.—*Zur Frage der Behandlung der Lungentuberkulose mit Auto-Misch-Vaccine, A. V. von Ilberg and F. Cantani, Ztschr. f. Tuberk., 1926, xlvi, 129.*—*(J. H. C.)*

Experiments with Oleo-Vaccine.—Four rabbits were used, all being treated with *Oleo-vaccine T. B.* Two rabbits were left as controls to show the noninfectivity of the oleo-vaccine. The other two were infected with living virulent bacilli of bovine type, and two other nonimmunized rabbits were also infected as controls. The immunized rabbits lived 63 and 71 days, and the controls 31 and 34 days. Of the control "immunes" one was killed, and no macroscopic findings of tuberculosis were noted. The other is still living. It is pointed out that the rabbits receiving the oleo-vaccine developed a more chronic form of tuberculosis when infected and lived twice as long as the controls.—*Further Experiments with Oleo-Vaccine T. B. in Attempted Immunity, W. T. Munro, Tubercle, June 1927, viii, 9.*—*(B. H. D.)*

Treatment of Tuberculosis of Skin with Vaudremer's Vaccines.—Vaudremer's vaccine was used with good results in a patient with ulcerative tuberculosis of the skin. In another patient with a similar affection, the use of the vaccine was followed by preliminary amelioration but recurrence was observed later. Vaccinotherapy in chronic diseases may be efficacious, but this efficacy is not constant. There is no way of determining which case will receive benefit and which will not. The action of a vaccine depends not only upon the method of preparation but also upon the individual reaction of the patient.—*Deux cas d'ulcerations tuberculeuse de la peau traitées par le vaccin de Vaudremer, Sézary, Meeting, Soc. Méd. d. Hôp., July 22, 1927, reported in Prog. Méd., August 6, 1927, no. 32, 1245.*—*(U. E. Z.)*

Treatment of Chronic Mixed Infection in Pulmonary Tuberculosis with "Omnadin."—The results of a series of from 12 to 18 *Omnadin* injections (*"Immunvollvaccine* 'Much' ") in cases of cavernous phthisis are recorded. Among 20 cases treated there were 12 that became free from bacilli, 2 that had temporary freedom from bacilli, and in 6 cases the sputum was uninfluenced. Recurrent fever, that had been frequent before treatment, did not occur in most of the cases after treatment.—*Die chronische Mischinfektion bei Lungentuberkulose und ihre Behandlung mit Omnadin, E. Möller, Beitr. z. Klin. d. Tuberk., 1926, lxv, 35.*—*(H. J. C.)*

Treatment of Tuberculosis with Vaccines of Atypical Tubercle Bacilli.—The tubercle bacillus, grown on ordinary media, sometimes possesses none of the classical characteristics. To study the vaccinating and therapeutic powers of such bacilli, 480 patients with predominantly extrapulmonary tuberculous lesions were treated. At first many of the patients developed aseptic abscesses at the site of inoculation, but by changing the method of preparing the vaccine such complications were avoided. The results in 260 cases are as follows: *1:* Lymph-node tuberculosis: of 123 cases treated 103 were cured, 18 were improved, and 2 remained stationary. *2:* Joint tuberculosis: of 87 cases treated 55 were cured, 22 were improved, 7 remained stationary, and 3 became worse. *3:* Genital tuberculosis (male): of 21 cases treated 20 were cured and 1 was improved. *4:* Bone abscesses: of 17 cases treated 10 were cured, 5 were improved, and 2 became worse. *5:* Cutaneous tuberculosis: of 7 cases treated 4 were cured, 2 were improved and 1 remained stationary. *6:* Renal tuberculosis: of 6 cases treated 5 were cured and 1 became worse. *7:* Peritoneal tuberculosis (female): the 2 cases that were treated were both cured. A successful result was obtained in 75.7 per cent. In patients with pulmonary lesions the vaccine should be given by mouth in order to avoid reactions which usually follow the injection method.—*Nouvelles recherches sur le développement du bacille tuberculeux, A. Vaudremer, E. Puthomme and J. Paulin, Meeting, Acad. Méd., February 8, 1927, reported in Prog. Méd., February 26, 1927, no. 9, 327.*—*(U E. Z.)*

Treatment of Pulmonary Tuberculosis with Living Virulent Tubercle Bacilli.—Twenty phthisical patients, males and females, in age from twelve to fifty-five years, were subjected to treatment, which consisted of rubbing into the skin of the upper arm two drops of a fresh, water-clear suspension of tubercle bacilli, which numbered 100,000 to the cubic centimetre of suspension. Two days after the infection there was a local reaction, and constitutional symptoms appeared in all. After one and one-half years it was found that four of the 20 had died, the earliest six months after the treatment; one had had an haemoptysis, and the others had died of progressive tuberculosis; and in all the prognosis had been poor. Of the remaining 16, 8 were in good general condition, 3 were in poor condition, and the remaining 5 had begun to improve shortly after the artificial infection, and have continued to improve. Whether the improvement was a result of the infection cannot be said with certainty, however.—*Ueber perkutane Einverleibung virulenter Tuberkelbazillen, H. Koopmann, Deutsche med. Wchnschr., May 20, 1927, liii, 880.*—*(H. S. W.)*

Surgical Treatment of Pulmonary Tuberculosis.—The rules for pneumothorax treatment outlined by Brauer two decades ago still hold. To use extrapleural thoracoplasty with a free pleural space is considered inadvisable. High pressure is to be condemned, since exudates and perforation into cavities are its result. A case of air embolism with fatal issue caused by the entrance of air into a vein injured by the needle is reported. The percentage of exudates (5 per cent) is low. Too much time should not be lost in conservative treatment in the presence of severe mixed infection in empyema, but early surgical treatment should be employed. Phrenic exairesis or Zadek's combination of pneumothorax and phrenic exclusion is not advisable, but in the case of partial pneumothorax phrenic exairesis can be valuable, as also in combination with extrapleural pneumolysis. Phrenic exairesis is not a simple procedure technically, and requires a trained surgeon. Exairesis alone may result in improvement as well as permanent clinical cure, although the latter is extremely rare. It can also serve as preliminary to thoracoplasty. The findings on the contralateral side must, however, be better than when artificial pneumothorax is used. Individualization should guide the choice of the Brauer or Sauerbruch procedure. *Iodipin* injected into the bronchi is wholly condemned in pulmonary tubercuosis, as a rule, although occasionally it may serve as a valuable diagnostic aid.—*Bemerkungen zur chirugischen Behandlung der Lungentuberkulose, H. Alexander, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 388.*—*(H. J. C.)*

Surgical Treatment of Pulmonary Tuberculosis.—This article reviews the subject of thoracoplasty briefly, and summarizes the results in more than 1,000 cases. Less than 4 per cent of these came to an early end. In favorable cases only 1 or 2 per cent died. Lasting cure resulted in 42 per cent and improvement in 40 per cent.—*Einiges über die neueste Entwicklung der chirurgischen Behandlung der Lungentuberkulose, F. Sauerbruch, München. med. Wchnschr., April 15, 1927, lxxiv, 619.*—(*E. R. L.*)

Indications for Collapse Therapy.—This therapy may be realized by three therapeutic measures separately or combined: (1) *pneumothorax*, always to be preferred as most effective, most innocuous and temporary, (2) *thoracoplasty*, and (3) *artificial diaphragmatic paralysis*. Pulmonary lesions may be roughly divided into (a) destructive, caseous and exudative, and (b) proliferative and constructive, or fibrous. Thoracoplasty is only applicable to the latter forms or to those showing such a reparative tendency, pneumothorax to the former. We are less concerned with the existence of contralateral lesions than with their activity. Collapse therapy acts in the following ways: *1:* By reduction of lung volume and functional and circulatory diminution, with resulting diminished toxic resorption. This effect is almost immediate. *2:* By slow and progressive sclerosis of the immobilized and contracted organ. This effect is particularly observed following thoracoplasty. Phrenicotomy permits a certain reduction of lung volume by diaphragmatic ascent. *Indications for Thoracoplasty: 1:* When pneumothorax is impossible to realize, provided (a) there is clinical integrity of the opposite lung, the requirements being much more exacting than for pneumothorax; (b) preservation of good general resistance; (c) existence of pleural adhesions and spontaneous tendency to pulmonary retraction and fibrous organization. Among the chief contraindications are active, febrile, caseous forms of disease, intestinal or renal tuberculosis, diabetes, badly compensated cardiac lesions, and certain cases of laryngitis. *2:* When pneumothorax has been abandoned or is insufficient. This frequently happens following adhesive pleurisies and is the signal for renewed activity of the lesion. Many cases of partial pneumothorax need thoracoplasty. *3:* As a substitute for pneumothorax. Certain cases of ulcerative basal lesions are better suited to partial thoracoplasty. *4:* In the treatment of pleuropulmonary and pleuroparietal fistulae. In such cases thoracoplasty obliterates the pleural cavity and restores lung collapse. To be effective, it must also obliterate the fistulous cavity. *Indications* for *Artificial Diaphragmatic Paralysis: 1:* Affections of the lower lobe, —bronchiectasis, tuberculous or gangrenous cavities. *2:* As a functional test of the other lung, preliminary to thoracoplasty. *3:* To treat recurrent haemoptyses, when pneumothorax is impossible. *4:* Cardiac embarrassment caused by dense fibrous adhesions. *5:* To supplement pneumothorax or thoracoplasty. *6:* As the first step of a thoracoplasty.—*Indications de la collapsethérapie, F. Dumarest, Section de Strasbourg in Rev. d. l. Tuberc., June, 1926, vii, 483.*—(*A. P.*)

Complications in Surgical Treatment of Pulmonary Tuberculosis.—The occurrence of caseous pneumonia after completion of the first stage of a Sauerbruch thoracoplasty is reported. The complication proved fatal and was verified at autopsy. In like manner there occurred in two cases an acute pneumonic condition after a left-sided phrenic exairesis. The first case was fatal, and in the second case recovery took place after a long time. The three cases are viewed as resulting from the aspiration of tuberculous material, due to unsatisfactory expectoration, even though in the first case Sauerbruch's directions of initiating the operation with the lower ribs were followed. It is not believed that paralysis of the diaphragm hinders expectoration, but the sudden and complete rest of the tuberculous foci and cavities in the upper lobe, brought about by phrenic exairesis, can cause aspiration into the lower parts of the lung. In addition the stasis of lymph plays a causative rôle. The so called gastrocardiac symptom-complex in phrenic exairesis was seen only once in 38 cases. The combination of artificial pneumothorax and phrenic exairesis is not advocated, since it precludes the possibility of using collapse therapy on the better side at a later time, and because subsequent expansion of the pneumothorax lung is made more difficult. Exairesis with existing pneumothorax was performed when broad adhesions prevented a complete collapse by reason of their extension over the apices and diaphragm. A case is reported of spontaneous pneumothorax following exairesis, with fatal outcome.—*Über schwere Komplikationen bei der chirurgischen Behandlung der Lungentuberkulose und über die gleichzeitige Verwendung von Phrenicusexairese und Pneumothorax, H. Deist, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 424.*—(*H. J. C.*)

Surgical Treatment of Pulmonary Tuberculosis.—*Medical Aspects:* Pleuropneumolysis, extrapleural thoracoplasty, and phrenictomy represent pulmonary-collapse therapy from a surgical standpoint, just as artificial pneumothorax represents it from a medical angle. The guiding principles of collapse therapy are rest for the entire body and functional rest for the diseased organ. To proceed with pneumothorax therapy as soon as an apical lesion is diagnosed in its incipiency is hasty and a measure easily avoided. It is equally wrong to defer intervention until the body reaches irresponsiveness to therapy. Tuberculous lesions of the intestines and kidneys are contraindications to collapse therapy. Tuberculous laryngitis, if the lesion is an early one, does not contraindicate such a procedure. In fact some laryngeal lesions show marked improvement following the cessation of cough and expectoration of bacilliferous sputum. In the face of cardiac lesions with tendency to decompensation and in .cases with an extremely low blood pressure surgical intervention must be forbidden. Patients with well-compensated valvular lesions may receive a carefully done therapeutic pneumothorax, but a thoracoplasty is very risky. Of the nontuberculous lesions of the kidneys, those characterized by organic changes absolutely exclude thoracoplasty. In mild cases pneumothorax may be attempted. In diabetes with complicating pulmonary tuberculosis thoracoplasty should be avoided and pneumothorax may be cautiously given in mild cases. Cauterization of pleuritic adhesions according to the method of Jacobaeus is not as simple practically as it appears to be theoretically. Its dangers are haemorrhage, empyema, and gas embolism. When adhesions are localized chiefly in the lower portion of the lung, especially at the diaphragm, there is the possibility of employing phrenicotomy, which is definitely indicated in lower-lobe lesions. Some authors regard phrenicotomy as an important predecessor to thoracoplasty. It is used to determine the functional capacity of the contralateral lung before surgical compression is done. According to Sauerbruch the best age for thoracoplasty is between fifteen and forty and better still between twenty and thirty-five years. Surgical treatment is intended primarily for cavities. If these are small they heal spontaneously, and if they are large collapse therapy offers the only chance for their obliteration. The best thoracoplasty produces a collapse one-fourth less complete than that produced by a pneumothorax (Brauer). In contradistinction to the fibroulcerative forms of tuberculosis, thoracoplasty is always contraindicated in the exudative, caseous, and bronchopneumonic forms. These are always accompanied by fever and severe toxaemia. Thoracoplasty is of value in the collapse of superficial cavities, the covering of which consists of the pleura and adhesions, because pneumothorax therapy will stretch the adhesions and possibly cause rupture of the cavity. Whenever the decision to institute surgical collapse is made, it must be done immediately.—*La cura chirurgica della tubercolosi polmonare. Parte medica, F. Galdi, Meeting, xxxii Congresso di Medecina Interna, October 27–29, 1926, reported in Tubercolosi, December, 1926, xviii, 490.*—*(U. E. Z.)*

Operations in Surgical Treatment of Pulmonary Tuberculosis.—*Surgical Aspects:* When pleural adhesions impede the success of artificial pneumothorax, two methods of sectioning them may be used: (1) The thoracoscopic method of Jacobaeus is of distinct value in certain cases, but the procedure is difficult and may be followed by serious complications (gas embolism, haemorrhage and empyema). When the adhesions are located in the basal portion cauterization is of no value. *2:* The open method of Leotta consists of the separation of adhesions manually through a wide intercostal incision. The wound is closed without drainage. The results are favorable in about 45 per cent of the cases. Severe pleurisy is a very troublesome complication. Apicolysis is no longer used because of the many complications and mechanical disadvantages associated with it. Phrenicotomy is a simple and well-tolerated operation. In some cases paradoxical respiration has been observed following paralysis of the diaphragm. Some of the pulmonary compression obtained in these patients is probably due to the upward pressure exerted by the abdominal viscera. Phrenicotomy is merely a palliative measure with very inconstant results. The success of a total thoracoplasty is often considerably aided by a phrenicotomy done before the ribs are resected. Partial thoracoplasty is technically an easier and better tolerated procedure. Some excellent results have been reported especially when done in conjunction with a phrenicotomy. However, the results of a complete operation are undoubtedly superior to those obtained when an incomplete collapse is done. Thoracoplasty is a very serious and grave procedure and should be reserved as a valuable method to supplement an impossible or inefficient artificial pneumothorax.—*La cura chirurgica della tubercolosi polmonare. Parte chirurgica, N. Leotta, Meeting, xxxii Congresso di Medicina Interna, October 27–29, 1926,*

reported in Tubercolosi, December, 1926, xviii, 499.—(U. E. Z.)

X-Rays in Surgical Treatment of Pulmonary Tuberculosis.—*Radiological Aspects:* In the field of therapeutic pneumothorax, radiology aids (1) by determining some of the indications for the procedure, (2) by establishing the technical possibilities of pneumothorax, and (3) by recording the course and results obtained. The X-ray probably occupies the place of greatest prominence in establishing the indications for thoracoplasty and phrenicotomy. In judging the results of the latter operations radiological methods occupy a second place. The important questions asked the radiologist concerning a case proposed for surgical treatment are: *1:* Do lesions exist in the contralateral lung? *2:* Whence did they arise? *3:* What is their nature? Usually one is able to answer the first question sufficiently well. Concerning the last question, a precise reply is often impossible, and the radiologist must exercise great caution without shirking responsibilities. All cavities do not warrant a grave outlook, and it is wise to remember that even large lesions appearing as cavities may not be true excavations, but may fall into the group of localized pneumothoraces or emphysematous blebs. When the lesion in one lung is advanced enough to require thoracoplasty, the contralateral lung is always more or less involved and in such cases roentgenography will usually reveal the lesion better than clinical findings. The condition of the mediastinum, its rigidity or mobility, is best determined by roentgen-ray studies. It is sometimes wise to actually test the flexibility of the mediastinum by inducing artificial pneumothorax regardless of clinical or X-ray findings. X-ray also offers valuable aid in deciding whether lesions exist in the gastrointestinal tract and in ascertaining the condition of the heart. Pleural adhesions, especially in an artificial pneumothorax, are best localized by stereoscopic plates. Radiology constitutes a reliable means of gauging the effectiveness of any procedure and is the only really indisputable method for making permanent records.—*La cura chirurgica della tubercolosi polmonare. Parte Radiologica, V. Maragliano, Meeting, xxxii Congresso di Medicina Interna, October 27–29, 1926, reported in Tubercolosi, December, 1926, xviii, 504.—(U. E. Z.)*

Nervous Accidents in Pleuropulmonary Operations.—With simple thoracentesis, such accidents are rare, although prior to 1850 there had been 8 cases reported. In the second half of the nineteenth century the number greatly increased. In 1888 Bouvret attempted a classification as follows: (1) paralyses of embolic origin, (2) motor disturbances of slow onset, (3) syncopal attacks, and (4) convulsive or eclamptic attacks, sometimes followed by transitory paralyses. The number of cases reported increased to 42 (Jeanselme, 1892), 86 (Cestan, 1898), 79 (Cordier, 1910). A more recent contribution was made by Mlle. Armand in 1921, based on accidents occurring in children alone following interventions on the pleura. Chabaud's work is based on reports in the literature in addition to two personal observations. The procedures giving rise to these accidents are (1) pulmonary operations, 3, (2) pleural lavage, 59, (3) exploratory or aspiratory punctures, 30, and (4) punctures to administer artificial pneumothorax, 22. Seven cases occurred spontaneously in the course of pleuropulmonary disease, provoked by no intervention. The manifestations have been grouped as syncopal, convulsive and paralytic, but often these are combined or they overlap. The syncopal form included 20 per cent of cases, with 80 per cent mortality. It occurred most frequently following puncture to induce pneumothorax. The convulsive form included 40 per cent of cases, with 50 per cent mortality, and occurred chiefly in the course of pleural lavage. In half the cases there were comatose or paralytic sequellae. The paralytic form usually manifested itself as a hemiplegia on the opposite side, more rarely as a paraplegia. It may be transitory or permanent. Syncope or convulsions nearly always precede the paralysis. *Time and Manner of Appearance:* Hardly a third of the accidents occur at the first intervention in the case of pleural lavage, two-thirds in the case of exploratory or aspiratory puncture, and a very small proportion at the time of the first puncture to induce pneumothorax. The symptoms have most often appeared at the moment of penetration of the pleura, but in a small proportion after a varying and occasionally prolonged interval. *Interpretation of Symptoms:* In a small minority of cases such organic lesions as generalized sclerotic myocarditis and other myocardial lesions have been found. One patient of Roch had an intense albuminuria during the comatose phase and prior to death, and one of Cain and Hilleman showed intense congestion of the suprarenal capsules. But these are exceptional and their relations to the symptoms doubtful. Of 114 cases, 110 can only be explained on one of two hypotheses,—(1) gas embolism, and (2) pleural reflex. *Gas Embolism:* Wever's observations on a patient in whom he cauterized a

bronchiectatic cavity are cited, also the ophthalmoscopic findings of several authors, and Brauer and Hegler's postmortem observations on the cerebral capillaries and arteries at the base of the brain. Wever also made interesting opthalmoscopic observations on apes, into whose carotids air was injected; the eye-grounds were soon converted into a network of striations. Air will rarely be found in the cerebral vessels after several hours have elapsed. As for the mechanism of gas embolism, Brauer and Wever believe aspiration of the alveolar air into a pulmonary vein from the capillary bed in the midst of dense tissue that is punctured to be the most common mode of production. It is also possible for a vein to debouche into a caseous focus laid bare by a ruptured adhesion and for fatal aspiration to occur by this method. Fluids or suspensions injected into pleural fistulous tracts may also enter the pulmonary circulation, as demonstrated in one case by Brandes. Nevertheless, it does not seem that the majority of accidents can be explained by either of the above mechanisms. Recurrences are especially difficult to explain in this way. Also, Bezançon and Azoulay recently cited a case, with necropsy, in which the pleura was absolutely free and the visceral surface untouched. *Pleural Reflex:* As early as 1854 Wintrich injected the pleural cavities of various animals with different gases. Hydrogen sulphide was the only gas capable of provoking pleurisies. Bard introduced balloons filled with water into the pleura, causing distention, but he observed no nervous troubles. Lamande irritated the visceral pleura of 4 animals mechanically without effect. Roch confirmed Bard's work. Cordier, however, in 1910, constantly set up convulsions by intrapleural injections of tincture of iodine, and carbolic and acetic acid, death ensuing. The parietal pleura alone is sensitive. Laborde, in 1872, by electrical stimulation of the intercostal nerves, was able in frogs to inhibit respiration and cardiac action, and others have obtained similar results in mammals. Cordier found that if the vagus nerve on the same side was sectioned prior to injecting the iodine, the convulsive response failed to occur, but the opposite side could still be injected with fatal result. It is true that such a form of irritation differs from that produced by puncture; also that the syncopal accidents have not been reproduced experimentally. Still, the mechanism may well be the same. Frequently there is doubt as to what has happened, despite careful history and observation. The marbling of the skin, thought by Brauer and Zink to be pathognomonic of air embolism, has been associated with other pathological states, and is doubtless a vasomotor phenomenon of bulbar origin; in fact, such vasomotor phenomena at the cerebral level might explain the mechanism of production of convulsions. A case is cited of a young woman of 25, who complained of pain at the first puncture for pneumothorax, at which a negative reading was obtained, and who shortly afterward became pale, lost consciousness and was rigid for a few seconds. A pneumothorax was demonstrated, with two filiform adhesions. A second puncture preceded by sedative analgesics was uneventful. It is believed that air embolism can be definitely excluded in this case. *Possibility of Prevention of Nervous Accidents:* To avoid gas emboli it would be necessary never to introduce any air without being sure of the separation of the pleural layers. A good precaution is to have at the first insufflation only negative pressure in the communicating vessels. When there is but a small pocket it would seem that oxygen might be preferred, although this by no means guarantees against embolism. There may be an hereditary factor in the case of pleural reflex, also decalcification may predispose to reflex spasm. Rist has noted that emotional, impressionable people are more likely to experience inhibitory phenomena from simple manipulations, such as vaccination. Lypothymia and vagotonia may play a rôle, as may fear, anxiety and anger. The best medicinal prophylactics are such specific sedatives for reflex activity as bromides and gardenal. Local anaesthesia should be carefully employed. The rare occurrence of these serious accidents can scarcely prejudice us against using pneumothorax, since among thousands of patients treated, with an incalculable number of punctures, by men whom Chabaud knows of personally, only six serious accidents occurred, three of which were fatal.—*Des accidents nerveux au cours des interventions sur l'appareil pleuro-pulmonaire, J. Chabaud, Rev. d. l. Tuberc., October, 1926, vii, 742.*—(*A. P.*)

Treatment of Pulmonary Tuberculosis with Artificial Pneumothorax.—Artificial pneumothorax is an accepted aid in the treatment of progressive pulmonary tuberculosis. Compression of the diseased lung aids the formation of fibrosis, partially or totally obliterates cavities, prevents haemorrhages, and retards lymphatic circulation, thus lessening toxaemia. Artificial pneumothorax is indicated in any case showing predominantly unilateral involvement, provided there are no definite contraindications and bed-rest has been tried. Tuberculosis of the larynx and the intestines

are not regarded as contraindications. The site of puncture should be chosen with precaution. It is emphasized that small doses repeated frequently give best results. Frequent physical and fluoroscopic examinations should be made. The exact location of the needle end throughout the operation must be known. The manometer aids in giving this information. Manometric readings are also informatory in regard to gas absorption, the amount to be introduced and the frequency of refills. The complications encountered are subcutaneous emphysema, air embolism, pleural exudate, spontaneous pneumothorax, and reactivation in the contralateral lung. The technique of the operation is described.—*The Use of Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis, M. H. Joress, Boston M. & S. J., April 28, 1927, cxcvi, 693.*—(*H. McL. R.*)

Artificial Pneumothorax.—Two patients with far advanced unilateral pulmonary tuberculosis are reported in whom artificial pneumothorax was induced. In the first patient there were severe haemorrhages, and while the ultimate prognosis is poor the pneumothorax has improved both the patient's chances and his comfort. In the second patient, owing to the length of her history and the probability of adhesions, the chances of inducing an artificial pneumothorax appeared small. The operation succeeded, however. Although the ultimate outlook is doubtful, the chances of life are improved, and the cessation of her severe cough with copious offensive sputum, and the knowledge that she is no longer a source of danger to others, greatly comfort the patient.—*Artificial Pneumothorax in Advanced Pulmonary Tuberculosis, D. Pickering, Brit. Med. J., June 11, 1927, no. 3466, 1055.*—(*W. I. W.*)

Artificial Pneumothorax.—The treatment of pulmonary tuberculosis by artificial pneumothorax exerts an improvement on the immunobiological relations of the body. Toxemia is reduced not only by total but also by partial pneumothorax. The connective-tissue formation around the bronchi, blood-vessels and interalveolar areas in the collapsed lung is due to atelectasis. It is greater as the collapse is longer and more complete. In prolonged pneumothorax connective-tissue proliferation occurs not only in the diseased, but in the healthy parts of the collapsed lung as well. With greater connective-tissue formation the lung loses its power to reëxpand, and a greater tendency towards the formation of transudates sets in. This condition almost always occurs after five or six months of total pneumothorax. Pleurisy usually complicates total pneumothorax but rarely the partial form. Early pneumopleurisies are due to inflammatory conditions, while the later ones result from actual transudates due to the connective-tissue overgrowth in the lung making it impossible for this organ to reëxpand.—*Zur Theorie und Praxis des künstlichen Pneumothorax, D. Meerson Ztschr. f. Tuberk., 1926, xlvi, 413.*—(*H. J. C.*)

Artificial Pneumothorax.—The presence of pleural adhesions should not contraindicate the establishment of therapeutic pneumothorax. It should serve as a warning to the patient that the procedure may be impossible of being carried out properly and an attempt should be made to institute a collapse. Very often a free pleural space is found sufficient to allow collapse therapy when adhesions were diagnosed. Artificial pneumothorax was done in 318 cases. In 202 of these the results followed were as expected and prophesied before the pneumothorax were started (either successful or failed). In 99 cases no attempt was made to foresee the result. In 17 cases pleural adhesions were diagnosed and failure was looked for. Pneumothorax was performed, nevertheless, and the results were very satisfactory.—*Il valore del nostro guidizio sull 'attuabilità' del pneumotorace, S. Sticotti, Tubercolosi, xix, June, 1927, 225.*—(*U. E. Z.*)

Artificial Pneumothorax in Childhood.—Two children presented signs of consolidation of the upper lobe in one lung. In one of the patients there was also a spina ventosa, and the other had cervical adenitis. Artificial pneumothorax was maintained for three years in one patient and two years in the other. After treatment the roentgenographic shadows were normal. As an adjuvant to pneumothorax treatment, heliotherapy was given in the summer and ultraviolet radiation in winter. The extrapulmonary lesions were also cured.—*Deux cas de tuberculose pulmonaire de jeunes enfants guéris par le pneumothorax artificiel maintenu respectivement pendant deux ou trois ans et accompagné d'héliothérapie et d'actinothérapie, Armand-Delille and Rovèche, Meeting, Soc. Méd. d. Hôp., June 24, 1927, reported in Prog. Méd., July 16, 1927, no. 29, 1116.*—(*U. E. Z.*)

Paradoxes of Artificial Pneumothorax. It has been noted that an artificial pneumothorax induced for haemorrhage is sometimes followed by aggravation of the haemoptysis. This has been variously explained as

due to a stretching of cicatricial tissue or to stasis of blood. In certain cases of haemorrhage arising from the hilum region, homolateral pneumothorax is ineffectual. A contralateral pneumothorax is sometimes successful because it is an aid to the process already started (shrinking of the diseased lung and displacement of the heart toward the affected side). This procedure is of value only in exceptional cases and especially those in which there is some attempt at retraction of the diseased lung as shown by radiographic studies. Three illustrative cases are reported—*Paradossi del pneumotorace artificiale, J. Geverder-Pedoja, Tubercolosi, April, 1927, xix, 137.*—*(U. E. Z.)*

Value of Artificial Pneumothorax.—Unilateral cases of tuberculosis with fibrosis and cavity-formation but without bronchogenic infiltration do very well under this treatment. Healing of the cavities is brought about in a short time. In cases of heavy fresh infiltrations healing does not occur so rapidly. The author's method for giving artificial pneumothorax is as follows: At the initial inflation 400–600 cc. of air is given. It is important that the intrapleural pressure does not become neutral during the expiratory phase of respiration. Eight days later a second refill of 600–800 cc. of air is made. A third refill of a 1000 cc. is again given fourteen days after the second. Further refills are given at intervals of four to six weeks. This method decreases the possibility of pleural exudates, while the pleura thickens and the absorption of the air does not take place so rapidly. In a series of over 2000 refills one death has occurred, and this was due to air embolism. Ten cases developed symptoms of air embolism but they disappeared in from half an hour to four hours. By carefully taking the manometric readings before air is permitted to enter, such accidents as emphysema, communication with a bronchus, spontaneous pneumothorax and air embolism may be avoided. Pleural adhesions often prevent the proper collapse of the lung, but artificial pneumothorax should always be tried before thoracoplasty is recommended. Just as pleural exudates often prevent artificial pneumothorax, so do they often interfere with good end-results in collapse therapy. Often a part of the collapsed lung becomes so firmly bound down by pleural exudates that it cannot reëxpand when the refills are discontinued. In such cases emphysema of the reëxpanded part of the lung takes place, filling up the pleural cavity. If tuberculin therapy is started with the artificial pneumothorax it often prevents the formation of pleural exudates. In cases in which there are hydropneumothorax and fever, tuberculin in proper dosage will bring about absorption of the fluid and a decline of the temperature to normal. This reaction is usually accompanied by polyuria.—*Wert der Pneumothoraxbehandlung und Winke für ihre erfolgreiche Dürchführung, W. Neumann, Wien. klin. Wchnschr., January 20, 1927, xl, 77.*—*(W. I. W.)*

Results of Artificial Pneumothorax.—From an analytical study of the literature and cases collected by the author, the conclusion is drawn that artificial pneumothorax effects a cure in 28.6 per cent of the cases in which it is applied. When pneumothorax is supplemented by strict sanatorium regimen the percentage of cures is a little higher (35.3). In speaking of a "cure" by this method, most authors intend it as a clinical cure (disappearance of all clinical signs and symptoms). Two years are required to attain a clinical recovery in the uncomplicated case under collapse. It is difficult to draw any conclusions as to the length of time required in patients with complications. It is impossible to ascertain, even with our modern methods of investigation, whether a tuberculous focus, although clinically silent for many years, is actually cured in the anatomical sense. The term "clinical cure" is not descriptive of the types of cases usually encountered. It is too exacting. The term "economic cure" is preferred by many observers. It is broad in its scope and is not too exact. An economic cure is the equivalent of restoring a patient to a "working capacity," which is possible of attainment, in a limited sense, even without the strictly clinical cure. Pneumothorax should always be started in a sanatorium or hospital. The patient must remain in an institution for from three months to one year. In the hands of competent physicians the pneumothorax may be continued outside the sanatorium with favorable results. In the present state of our knowledge, artificial pneumothorax is the most efficient therapeutic aid in pulmonary tuberculosis. Its therapeutic value is best represented by the number of cures obtained, by the ease with which the individual may be restored to working capacity and by the part it plays in suppressing the contagion of the disease. Since the application of this procedure among the working classes is of great social and economic benefit, it is necessary that provisions be made whereby it can be continued efficiently and with the least cost to the patient.—*Il pneumotorace artificiale nella cura della*

tubercolosi. Risultati immediati e a distanza, G. Ronzoni, Meeting, Primo Congresso della Società Italiana di studii scientifici sulla tubercolosi, Milan, October 23–24, 1926, reported in Tubercolosi, December, 1926, xviii, 447.—(U. E. Z.)

Healing in Artificial Pneumothorax.—The X-ray picture does not allow a differentiation between noncaseated infiltrations and true caseous pneumonias. In the case reported a cavity 1 to 3 cm. in size appeared 1½ months after the inception of pneumothorax treatment. Since the patient had rapidly improved during that period, this finding is interpreted not as a cavitation occurring during pneumothorax treatment, but it is supposed that the cavity became visible only after the lung had been collapsed. This cavity became very much smaller under further collapse therapy. Thin-walled cavities of the type mentioned yield satisfactory results under collapse therapy; the same is true of early exudative processes. The author urges, therefore, the early institution of pneumothorax in purely exudative lesions.—*Zum Verlaufe der Heilung in der Pneumothoraxlunge, F. Fleischner, Wien. Klin. Wchnschr., April 14, 1927, xl, 492.—(M. P.)*

Healing of Cavities by Artificial Pneumothorax.—Artificial pneumothorax is the most successful method of treating cavities in pulmonary tuberculosis. Four cases are reported in this study in which X-ray pictures showed cavities that disappeared during treatment. *Conclusions: 1:* Collapse therapy brings about the healing of cavities in a relatively short period, as is proved by the clinical course and X-ray pictures. *2:* In all cases of cavity in which there are no contraindications, pneumothorax should be given. *3:* The best results are obtained when the therapy is started early.—*Kasuistischer Beitrag zur Kavernenheilung durch künstlichen Pneumothorax, A. Baer, Wien. Klin. Wchnschr., January 20, 1927, xl, 83.—(W. I. W.)*

Indications for Artificial Pneumothorax.—Although the general practitioner may not be prepared to administer artificial pneumothorax, nor to decide definitely whether this treatment is indicated in a given patient, he ought to be sufficiently familiar with the indications and contraindications not to fail to suggest it in suitable cases. The main indications are as follows: *1:* Strictly unilateral lesions. Since it is well known, however, that a large percentage of unilateral apical lesions never progress nor cause serious trouble, pneumothorax should be given only when such symptoms or signs occur which augur a progression, such as signs of beginning cavitation, the appearance of tubercle bacilli in the sputum, or haemorrhages, or a longer duration of the disease. The latter indication requires good judgment based on large experience. It may be a very difficult task to establish the unilaterality of a process. *2:* Bilateral lesions which show signs of progression and destruction on only one side. The contralateral lung should not show evidence of extensive infiltrations, as manifested by dulness and bronchial breathing, nor signs of cavitation, nor widespread processes of cirrhosis, shrinkage, nor broad pleural adhesions, nor haemorrhage. The general condition of the patient must be duly considered. *3:* Bilateral grave lesions, which show signs of cavitation only on one side. Pneumothorax must be considered as a last resort in such patients. The occasional good results in simultaneous or successive bilateral pneumothorax offer encouragement for this type of cases. *4:* Tuberculous empyema, after the pus has been withdrawn as completely as possible. *5:* Serous, tuberculous pleuritis of long duration. In such cases the treatment may be indicated in order to prevent the formation of excessive adhesions. *6:* Continuation of a spontaneous pneumothorax. *7:* Certain nontuberculous affection. In bronchiectasis the result is usually unsatisfactory on account of broad adhesions. In abscesses surgical treatment is preferable as a rule. *8:* Pneumothorax may be induced for diagnostic reasons. A number of contraindications must be considered, such as caseous pneumonia, mixed infection of septicaemic type, extensive ulcerations in the larynx or intestines, and bilateral renal tuberculosis. Pneumothorax should not be induced when severe renal disease, cardiac decompensation, pericarditis, advanced myocardial changes or diabetes coexist. The most important complications in pneumothorax therapy are exudates and adhesions. The results are favorably represented, but the author does not record his own experiences. Small contralateral lesions may be benefited. The question of how long to maintain a pneumothorax varies with each patient; his general condition and the observation of the contralateral lung must guide the decision in combination with the probable time after which reëxpansion can be expected. It is of particular importance to observe the patient carefully during the time of deflation.—*Die Indikation zum künstlichen Pneumothorax und seine Erfolge, L. Petschacher, Wien. klin. Wchnschr. July 28, 1927, xl, 961.—(M. P.)*

Mechanism and Indications for Artificial Pneumothorax.—Artificial pneumothorax gives rise to two conditions which aid in the cure of tuberculosis. It prevents bronchogenic spread and limits the absorption of toxic products. Radiographic studies aid materially in determining the efficacy of pneumothorax therapy. They will show any healing that takes place and will demonstrate any extension of the process that may occur in spite of treatment. A rapid spread of the disease is often seen when artificial pneumothorax is instituted in the presence of caseous pneumonia or rapidly disseminating bronchopneumonia. In such cases collapse therapy is frequently unable to check the inevitable generalization of the disease. Roentgen-ray studies may also demonstrate the formation of an unsuspected cavity in the compressed lung. The collapsed lung is the seat of an extensive sclerosis which leads to a cicatrization of caseous foci. Cavitating lesions become replaced by dense fibrosis. The sclerosing process may begin in the pleura, especially when the pneumothorax is complicated by pleuritis. Histologically the sclerosed lesions have the characteristics of an attenuated inflammatory process. The parenchyma of the lung immediately surrounding the sclerosed areas is in a state of more or less atelectasis. Immobilization of the lung is as useful for the healing of a lesion as is immobilization of a tuberculous joint. The collapsed lung is unfavorable soil for the life of the tubercle bacillus. Pulmonary compression prevents secondary infection. It permits the approximation of cavity walls to each other and consequently its obliteration. Pneumothorax may not completely prevent a bronchogenic spread, but it minimizes its possibility. Blood-stasis and other circulatory changes in the lung under collapse therapy are probable causes of sclerosing processes. There is a distinct increase in the intensity of the skin reaction during the first few days following the establishment of artificial pneumothorax. This fact may be of value in determining the prognosis of the procedure. During pneumothorax therapy there is a diminution in the amount of tuberculosis antibodies in the blood serum. With the onset of an effusion during collapse therapy, the antibodies are increased, and as the fluid is absorbed they are diminished. The skin reaction is not influenced by this complication. *Indications:* Artificial pneumothorax may be instituted as an emergency measure in cases of grave haemoptysis. In the elective cases it is necessary to consider (1) the general condition and resistance of the patient, (2) the condition of the various organs of the body, (3) the unilaterality of the lesion, (4) the clinical-anatomical form of the lesion, and (5) the accessibility of the pleura. An anatomically unilateral lesion is very rare. In many of these cases the minimal contralateral involvement is quiescent and in no way contraindicates pneumothorax therapy. The lesion in the opposite side is frequently benefited by the collapse of the most affected lung, either by the hyperfunction which it is called upon to perform or because of improvement in the general condition of the patient. The question concerning the strictly one-sidedness of the lesion is not losing its importance since the possibilities of a bilateral pneumothorax have been demonstrated. The early induction of artificial pneumothorax is important. Prompt intervention produces better results because the patient's general condition is still good and there is less liability that complications will arise, such as haemoptyses or new localizations in the opposite lung, larynx or intestines. The presence of pleural adhesions will be minimized by an early collapse. The possibility of establishing artificial pneumothorax in pregnant women should always be considered before resorting to the interruption of the pregnancy.—*Il pneumotorace artificiale nella cura della tubercolosi, Ragioni Scientifiche-meccanismo d'azione—Indicazioni del pneumotorace terapeutico, V. De Bonis, Meeting, Primo Congresso della societa Italiana di studii scientifici sulla tubercolosi (Milan), October 23-24, 1926, reported in Tubercolosi, December, 1926, xviii, 447.*—(*U. E. Z.*)

Pocket Apparatus for Artificial Pneuthorax.—Although there have been numerous minor modifications of Forlanini's apparatus, the general principle has remained much the same: a water manometer to measure pressure, and a gas reservoir from which known amounts can be introduced by displacement of liquid in communicating vessels. All such apparatus has these disadvantages: (1) they are too large and cumbersome and inconvenient to transport; (2) they are all of glass construction, and hence breakable and difficult to repair away from the larger centres; (3) they contain liquids which may spill or be blown out during insufflation; and (4) they weigh too much, including the liquids and the box in which the apparatus is contained. In order to avoid these inconveniences, Mainini has had constructed by Boulitte the apparatus he now describes. The important factors in giving pneumothorax, as determined by extensive experience, are: (1) the intrapleural pressure, (2) the mediastinal position, and (3) the behavior of the col-

lapsed lung. Of lesser importance are (4) the choice of gas,—air, which is always obtainable, serves all necessary purposes, and (5) the quantity of air introduced. This is of relative importance only, especially in total pneumothorax. When the initial pressure is negative, air is easily aspirated with each inspiration. All that is necessary is to introduce a cotton filter. No pressure is needed in the case of a virgin pleura. The apparatus described and illustrated consists of (1) a manometer, (2) a pump, (3) a stopcock, (4) a rubber tube, (5) a valve, (6) a cotton filter, (7) an ampule-bulb control, and (8) needles. The manometer is metallic and very sensitive and its divisions run from +40 to −30. It is circular, read like an aneroid, and communicates by means of the stopcock and tube with the main tubing going to the needle. The pump is of the simple compression type, and a complete push sends out about 20 cc. of air through a valve into the main tubing going to the chest. The stopcock, a three-way one, communicates with the pump, and turning this either allows it to pump air into the pleural cavity or shuts it off and opens the manometer connection. The number of strokes of the pump multiplied by 20 will give the number of cubic centimetres of air injected. Before withdrawal of the needle from the chest the manometer reading is always taken. If the pressure should be excessive, another interposed valve is opened until it is reduced to that desired. *Technique:* The needles are sterilized in a dry oven, the filter in an alcohol flame. The tubing, ampule, and needle holder are boiled. The apparatus is put together and the pump tested before using. For the first insufflation, a fairly large needle, 1.2 mm. or 1.5 mm. diameter, is used. No manometric oscillation is to be expected prior to the introduction of air. When the manometer falls the valve is opened and the patient aspirates air with each inspiration. This gives a characteristic sound. As soon as satisfactory oscillations appear the valve is closed, and the insufflation is completed with the pump. Physical and, if possible, X-ray examination, is then performed. It is believed that this simple instrument, which is obtainable at a modest price, marks a practical advance in pneumothorax technique.—*Appareil de poche à pneumothorax artificiel, C. Mainini, Rev. d. l. Tuberc., August, 1926, vii, 619.—(A. P.)*

Portable Artificial-Pneumothorax Apparatus.—Details are given of a small portable pneumothorax apparatus, which, when folded in a box, measures only 34 x 14 x 6 cm. and weighs but 1,250 gm. It is so constructed that it can operate either by pressure or suction, and makes "tension-pneumothorax" remote. Air, nitrogen, hydrogen or carbonic acid may be used without alteration in the machine, the constituent parts of which are standard and therefore easily replaced. A water manometer serves to measure the pressure during either the ingress or egress of gas. A glass cylinder of 100-cc. capacity is closed at each end with large rubber stoppers, each containing a perforation for a tube, which in the upper stopper connects with a rubber condom that hangs loosely into the cylinder and acts as a membrane-pump. Air is introduced into this membrane in sufficient amount for it just to reach the sides and bottom of the cylinder. The latter is so arranged with a two-way stopcock and rubber bag that, when the cylinder is filled with gas from the bag, the thin membrane undergoing more or less collapse meantime, the pressure within the latter slowly forces the gas into the pleural cavity.—*Ein transportabler Pneumothoraxapparat, F. v. Kovâts, Deutsche med. Wchnschr., June 3, 1927, liii, 969.—(H. S. W.)*

Ergomanometer in Artificial Pneumothorax.—The determination of the "optimum pressure" corresponding to perfect pulmonary collapse has been the greatest problem in the technique of pneumothorax. The conditions of pulmonary compressibility and its criteria have seemed to be inconstant, the first because of the varying character of the pulmonary lesion, the second because of the limitations of the double-branch manometer. Parodi has previously shown how the technique depends on dynamic considerations. The pulmonary mass is held against the thoracic wall by forces of different order and of equal and contrary values: on the one hand, the elastic tension of the inflated lung; on the other, the force of adhesion, superficial tension, capillarity, gas exchange, etc. The true endopleural pressure is almost equal to the atmospheric, if the lung has preserved its power of elastic recoil. Under pathological conditions, however, there occurs a "static depression," due to diminished elastic tension. The pleural space remains, but the thoracic wall retracts. Diaphragmatic movement, although physiologically synchronous with pulmonary movement, is actually almost independent of pulmonary elasticity, and is dependent on relations between intrathoracic and intraäbdominal pressure. Under pathological conditions diaphragmatic and thoracic movements become dissociated. A cushion of air introduced into the pleural cavity of a perfectly

elastic lung does not affect the volume of the former, but the mobility of the thoracic cage diminishes. When the force of traction becomes equal to that of adhesion, movement ceases, although diaphragmatic movement continues. The cessation of thoracic movement, then, always signifies a complete collapse, not necessarily absolute, but the most complete obtainable. In case of mediastinal instability, modifications in pressure are caused by the movements of the mediastinal organs. In measuring pressures in pneumothorax, Parodi has previously shown the necessity of substituting for the double-branch manometer, in unstable equilibrium, one in stable equilibrium. With the ergomanometer the two respiratory phases are observed separately. *Principles of the Ergomanometer:* It is composed of two glass tubes concentrically arranged, the inner immersed in a fluid reservoir in a bulb at the base of the outer, which communicates by a side-arm and bulb with the atmosphere. There is a four-way stopcock, permitting of various communications and determinations. These are illustrated by an accompanying diagram. The following can be determined: (1) amplitude of movement of thoracic cage and diaphragm, (2) elastic contraction or suction power of lung, (3) dynamic condition of mediastinopulmonary wall, and (4) presence and location of adhesions. The apparatus can partly replace fluoroscopy. *Interpretation of Ergomanometric Results:* This should be done with the following principles in mind: (1) the elasticity of the pulmonary parenchyma rules the amplitude of movement of the chest, and (2) movements of the chest-wall and diaphragm are not necessarily synchronous. The following consequences may be deduced: *1:* The inspiratory and expiratory phases are dynamically equivalent. *2:* The elasticity of the pulmonary parenchyma does not exert the same influence on diaphragmatic movement as it does on that of the thoracic cage. From these considerations it is possible to deduce very full information as to the status of lung, pleura, mediastinum and diaphragm. The results of readings in all positions should be tabulated and charted. One may determine the *character of the dominant respiration* on the pneumothorax side, as follows: (1) costodiaphragmatic or normal respiration, (2) diaphragmatic respiration, movements at the base prevailing, and (3) abdominal respiration, with thoracic cage immobile and diaphragmatic movement governed by abdominal pressure. In type 1 the readings are positive in positions 2 and 3; in type 2 positive in 2 and 1, negative in 3; in type 3 negative in 2 and 3, positive in 1. A diagram of the apparatus and examples of charted readings accompany the article. *Conclusions:* From ergomanometric readings can be deduced a series of ideas which enable an exact knowledge of what goes on in the pleura. The following can be determined: *1:* Character of the dominant respiration on the pneumothorax side. *2:* Integrity of pulmonary elastic tension. *3:* State of pulmonary compression. *4:* Limit of pulmonary compressibility. *5:* Topography of pleural cavity. *6:* Dynamic conditions of the mediastinopulmonary wall.—*L'ergomanomètre appareil destiné à l'évaluation analytique des pressions dans le pneumothorax, F. Parodi, Rev. d. l. Tuberc., October, 1926, vii, 721.—(A. P.)*

Manometric Measurements in Artificial Pneumothorax.—The same oscillations occur in two manometers of widely different bores under the same conditions of pressure. Placing the filter in front of the manometer is to be avoided. Manometer fluids of watery solutions with dye or sublimate gave fair agreement in oscillations. Viscosity and capillary attraction did not influence the results. Manometers below 2-mm. bore were liable to cause a separation of continuity of the fluid, especially in the case of rapid and high oscillations. Rapid respirations and high pressure changes between inspiration and expiration caused a pendulum-like swaying of the fluid, any attempt to overcome which would be undesirable, as it would do away with the warning that the needle had penetrated the pulmonary parenchyma.—*Über Manometer und manometrische Messungen beim Pneumothorax, R. Bucher, Beitr. z. Klin. d. Tuberk., 1926, lxv, 139.—(H. J. C.)*

New Technique in Artificial Pneumothorax.—This method of treatment is still not used to the extent that it might profitably be, partly owing to operative difficulties and complications related to faulty technique. In 1920 Pop devised a simple technique applicable to almost all cases and yielding good results. The principle is to realize as complete a collapse as possible with the least trauma. Surgical methods of entrance have rightly been abandoned, but even puncture with a cannula is not free from disadvantages, as the pulmonary parenchyma may be penetrated, thereby risking gas embolism or pleural infection. Pop and his coworkers have devised a cannula slightly sharpened at the tip, and this is inserted in that part of the thoracic wall where adhesions are least frequent, either the scapular line or a lateral line between 3 and 4 cm. at the level of the ninth and

eleventh ribs. The possibility of penetrating a pulmonary lesion here is remote, especially since the lower border of the lung does not reach the pleural cul-de-sac except during inspiration, and then only to the ninth rib; in expiration it is retracted to the seventh intercostal space. Moreover, this cul-de-sac normally contains a small quantity of synovial serous fluid, and this is commonly increased in the presence of a pulmonary lesion from a few drops to several cubic centimetres. Its presence facilitates the introduction of the cannula, to which is attached a small safety syringe. The cannula used is 5 to 6 cm. long, from 0.75 to 1 mm. in diameter, and bevelled at 45 to 50 degrees. It has these advantages: (1) ease of carriage, (2) possibility of complete and thorough sterilization, and (3) easy adaptability to the control syringe. Any apparatus can be used which has a water manometer. *Technique:* The patient is placed in a sitting posture, his back toward the operator, with arm on head to separate the intercostal spaces. The apparatus is on the operator's left, the rubber tubing, with a 1 to 2-cc. Record syringe attached, in his hand. For aspiration a 10 to 20-cc. syringe is substituted. Anaesthesia is generally dispensed with, as being almost as painful as the puncture. The tip of the index finger of the left hand is applied immediately below the point chosen by clinical and radiographic examination. With the syringe held like a pen, the tip of the cannula is taken between the fingers of the right hand, and introduced slowly and perpendicularly through the skin and cellulo-adipose tissue. Its passage demands some force, which should be at once reduced before entering the pleura; for this purpose the syringe is taken between the first and second fingers, the fourth and fifth resting on the chest-wall, the third guiding the cannula. When the cellulo-adipose layers have been penetrated the piston of the syringe is seized with the right hand and withdrawn slightly, and then the tip of the cannula is very carefully advanced. As soon as the parietal pleura is punctured serous fluid is aspirated into the syringe. Immediately the syringe is disconnected, and the smaller one attached to the rubber tube is connected. Manometric oscillations confirm the fact that the needle is in the pleura. The third step, insufflation, is performed after it is ascertained that the cannula is permeable by inserting a stilet. *Summary of Advantages of this Technique: 1:* It is not traumatizing and causes little pain, compared with that when blunt-end cannulas are used. *2:* Entrance into the pleural cavity is signalized both by aspirated serous fluid and by the manometer. *3:* The possibility of gas embolism is excluded by the use of the syringe, which, if the needle is in the parenchyma, will draw back a few drops of blood. *4:* Pulmonary lesions are not likely to be punctured. *5:* No special instruments are required, but merely a little dexterity. Of 193 attempts to perform pneumothorax, 173 (89.6 per cent) have been successful.—*Nouveau procédé du pneumothorax artificiel, L. Pop, Rev. d. l. Tuberc., December, 1926, vii, 878.*—(*A. P.*)

Technique, Symptomatology and Management of Artificial Pneumothorax.—Theus vario types of apparatus for the induction of artificial pneumothorax are described in detail. Absolute asepsis on the part of the operator performing therapeutic pneumothorax cannot be too strongly urged. The initial amount of gas given may vary from 250 to 300 cc., the maximum 600 cc. Gas should never be introduced unless there is an undoubted negative intrapleural pressure and unless there is spontaneous aspiration of gas from the pleural cavity. Refills should average 250 to 500 cc. every one or two days until the intrapleural pressure oscillates around zero. When pleural adhesions exist and the pneumothorax is only partial, the introduction of gas should be done at more frequent intervals and in lessened amounts. At the beginning of an artificial pneumothorax the patient should remain in bed. In cases in which a bilateral pneumothorax is done the pressures should be very low and the operator must exercise careful watchfulness. Possible accidents of minor importance are injuries to the intercostal blood-vessels or nerves and injuries to the lung by puncture. Subcutaneous or subpleural emphysema is not very serious, but it should be avoided, if possible, by careful technique. Deep emphysema, involving the interstitial tissues of the lung and mediastinum, may cause serious trouble by compression. Reflex disturbances often occur in nervous patients. Pleural eclampsia is a rare and unwelcome complication. These patients suffer marked psychical and circulatory depression. Motor disturbances (tonic and clonic spasms) are sometimes encountered. There exists considerable doubt as to whether many of these nervous phenomena are due to reflex causes or to gas embolism. The control of artificial pneumothorax by radiological studies is very important and helpful. Changes in the intrapleural pressure may occur, and they should not be passed over too lightly. The increase in pressure is frequently an early indication of a beginning pleural effusion. In many cases the

tendency toward a positive pressure denotes a beginning rigidity of the pleura. Pneumothorax must be abandoned when the lung is merely shifted and not collapsed. Excessive displacement of the diaphragm and mediastinum must be avoided in order to prevent paradoxical respiration. General improvement may occur very rapidly or very slowly. Anatomical healing is a very slow and gradual process under collapse. Of the complications that may occur during pneumothorax pleurisy with effusion has been observed in 50 per cent of the cases. The effusion, due to tuberculous involvement of the pleura, is at first serous, and after a variable period of time it shows tubercle bacilli. It frequently becomes a true tuberculous empyema. This last-named complication is a very serious one. However, in the majority of cases the fluid is gradually absorbed. In patients showing delayed absorption of the exudate the fluid may be removed and replaced by an equal quantity of air. If the fluid is purulent thoracocentesis and pleural lavage may be done. Various solutions have been used for this purpose, such as lysoform, Carrel-Dakin solution, gentian violet, etc. When the empyema is purely tuberculous, the chest must remain closed. Thoracotomy is indicated only in extreme cases. Quartz-lamp therapy, roentgen-ray, or heliotherapy may be utilized in some cases of long standing. Perforation of the lung is fortunately a rare occurrence. The formation of a pleuropulmonary fistula is a grave and often irreperable complication. Collapse should be continued as long as possible. The minimum period should be one to two years. A clinical cure by artificial pneumothorax is manifested by (1) massive fibrosis of the previously diseased area with cicatricial contraction; (2) return to normal respiratory function by the nonaffected pulmonary tissue, even after prolonged immobilization; (3) reintegration of the perviousness of the pleura and mobility of the lung in cases not complicated by pleurisy with effusion; and (4) sustained compensatory hyperfunction and hypertrophy of the healthy lung. In many cases rigid-walled cavities are observed which do not close under pneumothorax therapy and in these patients, thoracoplastic intervention should be considered.—*Il pneumotorace artificiale nella cura della tubercolosi polmonare, Tecnica, simtomatologia e condotta della cura, U. Carpi, Meeting, Primo Congresso della societa Italiana di studii scientifici sulla tubercolosi, Milan, October 23, 26, 1926, reported in Tubercolosi, December, 1926, xviii, 464.*—(*U. E. Z.*)

Technique and Results of Artificial Pneumothorax.—The relative merits of the puncture and incision methods of instituting pneumothorax are discussed, and the latter is recommended for beginners, as well as to prevent gas emboli. Two hundred initial cases, according to Kaufmann's modification of the incision method which was used without complications, are reported. In reply to the question as to what can be accomplished by means of artificial pneumothorax it is believed that this is dependent upon the indications in the case. If the indications and limitations outlined by Schroeder are adhered to the results are very satisfactory. Pneumothorax cannot be used as a general method and must be considered in each individual case only as an additional measure to be utilized with general treatment.—*Über Tecknik und Erfolge des künstlichen Pneumothorax, G. Schröder, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 263.*—(*H. J. C.*)

Selective Collapse in Artificial Pneumothorax.—A partly collapsed lung participates in the respiratory movements by the same mechanism as a normal lung. Since the air mantle in the pleural cavity can be expanded only to a very small degree, it is obvious that with the inspiratory expansion of the thorax air must enter the bronchial system. With increasing collapse an increasing number of finer tubules become closed by a collapse of their moist walls. To reopen such tubules against the forces of capillary attraction requires a greater tension than the one exerted by the respiratory movements. This tubular collapse is obviously achieved much sooner in a diseased lung with infiltrations, fibroses and destruction of elastic elements. This fact, that a smaller amount of pulmonary collapse (lower intrapleural pressure) brings about a tubular collapse in a diseased lung than in a normal lung, explains the mechanism of selective collapse.—*Der selektive Kollaps des Kranken Lungenteiles im Pneumothorax, F. Fleischner, Wien. klin. Wchnschr., October 20, 1927, xl, 1323.*—(*M. P.*)

Incomplete Artificial Pneumothorax.—A man, aged 26, was discharged as an excellent recovery after 18 months' treatment for pulmonary tuberculosis of the right upper lobe. He was engaged in farm work upon the advice and sanction of his physicians. About two years later he became very ill with an acute exacerbation which spread rapidly through the right lung, chiefly affecting the base. He had severe cough with copious expectoration rich in tubercle bacilli. Upon examination, besides the extensive involvement on the right side, some moist crackling râles were heard in the upper part of the left lung. As a last resort

artificial pneumothorax was attempted. Although only a partial pneumothorax was obtained, the patient was considerably improved and the signs in the left lung became diminished in extent and intensity. About nine months after the pneumothorax was started a small serous effusion developed, and, incidental to this, the adhesions gave way and the pneumothorax became nearly "complete."—*A Case of Artificial Pneumothorax, B. Hudson, Brit. Med. J., February 19, 1927, no. 3450, 323.—(U. E. Z.)*

Bilateral Artificial Pneumothorax.—The work appearing in the last ten years on collapse therapy has served to widen its indications. Simultaneous bilateral pneumothorax seems the last step in this evolution. Gwerder Pedoja, of Davos, in 1917, introduced the term "relaxation pneumothorax" and published the indications and results of a procedure reserved for advanced bilateral cases. He began carefully with collapse of the more affected lung, a purely symptomatic or palliative intervention. He was surprised to note marked and rapid improvement and that often the gas localized by preference about active lesions. Even the late results he reported were remarkable. Then, following the communications of Morgan, Barlow and Kramer, and Bernou, the technique of classical pneumothorax underwent great modification. Both cicatricial contraction of the lesions and secondary recuperation of healthy tissues were aimed at. After total collapse of the lung was accomplished a proper spacing of insufflation permitted a certain reëxpansion of healthy parts of the lung, infiltrated zones remaining immobile and retracted. With the aid of the screen a veritable therapeutic and functional selection could be obtained. Evident advantages were an absence of pulmonary overwork and embarrassment, less frequent pleural reactions, and less marked constitutional disturbance, especially loss of weight. The first reported observations on double pneumothorax were those of Ascoli in 1912. Almost at the same time, Parry Morgan published his results, in 1913 Maragliano his, and in 1914 Faguioli. Later came those of Abbott, Barlow and Kramer, Bergmann, Ferreira, Stockler and Samson. In France, Bernou and Ameuille were the pioneers (1923). In general, the procedure may be said to be the method of choice in cases of early progressive bilaterilization of disease. Four typical cases are reported, with roentgenographs and temperature charts. The first considerations to be thought of are: How is the patient going to tolerate this new reduction in the field of haematosis? Spirometric studies and determination of gases in the blood are scarcely applicable to patients with active disease. Repeated fluoroscopic examinations and good roentgenographs are of much more value. A good preliminary topographical diagnosis is an important preliminary. Bilateral pneumothorax must be recognized as a grave intervention, a forcing of the hand in view of certain risks. Repeated observations, especially roentgenographic, are necessary. If it is to be performed at all the procedure must be undertaken before the general state has deteriorated too far. The procedure must be limited to the specialized physician, who has had a long experience with collapse therapy. It is impracticable outside of a hospital, institution, or specialized clinic, and the patient must be docile and coöperative. Climatic, hygienic and dietetic measures are not be be neglected. The technique is subject to wide variation and must be individualized.—*Le pneumothorax thérapeutique bilatéral simultané, F. Tobé and J. Terrasse, Rev. d. l. Tuberc., August, 1926, vii, 576.—(A. P.)*

Bilateral Artificial Pneumothorax.—The institution of a bilateral pneumothorax was carried out in five cases as a last resort measure with satisfying results. As in unilateral pneumothorax this procedure should be carried out early, especially in acute cases before much fibrotic reaction has taken place. This is particularly advantageous in order to avoid dense pleural adhesions. Although one would suspect disastrous results from the marked reduction of respiratory area, nevertheless, the difficulties encountered are not much more than those observed in unilateral cases. Careful regulation of the endopleural pressure is of course very necessary. This method of treatment should not be the rule in all bilateral cases, but must be used only when all other methods have failed. The general nutrition of the patient as an index of resistance must be considered. It is useless in cases with far advanced progressive lesions involving most of both lungs. If complications exist the treatment should be avoided. It is well to start with small amounts of air in order to gauge the patient's reaction. Sanatorium care is important in carrying on this procedure.—*Contributo allo studio del pneumotorace terapeutico bilaterale simultaneo, S. Morelli, Tubercolosi, August, 1927, xix, 310.—(U. E. Z.)*

Bilateral Artificial Pneumothorax.—During the course of a unilateral pneumothorax, instituted for haemoptysis, the patient developed a cavity near the hilum of the contralateral lung. Another artificial

pneumothorax was performed on this side. The patient gained 9 kilos in weight. The respiratory capacity after the bilateral pneumothorax was diminished by 265 cc.—*Pneumothorax bilatéral, Rist and Couland, Meeting, Soc. Méd., des Hôp., May 27, 1927, reported in Prog. Méd., June 18, 1927, no. 25, 965.*—*(U. E. Z.)*

Bilateral Artificial Pneumothorax.—Seven cases are reported in which bilateral artificial pneumothorax was used. In 4 of these patients bilateral pneumothorax was maintained simultaneously. No encouraging results were obtained in these patients. In 3 patients pneumothorax was established on one side after pneumothorax treatment had been completed on the other side. The results in these cases were very satisfactory.—*Über nachträglich doppelseitigen und gleichzeitig doppelseitigen künstlichen Pneumothorax der Lungentuberkulose, H. Maendl, Wien. klin. Wchnschr., March 17, 1927, xl, 347.*—*(M. P.)*

Contralateral Pressure in Bilateral Artificial Pneumothorax.—It often happens, in the course of induced bilateral pneumothorax, that the introduction of as little as 200 to 300 cc. of gas into one pleura sets up marked respiratory difficulties. Observations on mediastinal displacement led to the supposition that the other side might be considerably affected, and indeed "balance movements" of the mediastinum following such insufflations have been observed. The relative mobility or fixity of the mediastinum is an important factor in determining these effects. In certain unilateral pneumothorax cases with very mobile mediastinum the induction of a contralateral pneumothorax to push it back might be considered.—*L'influence d'une insufflation sur les pressions du côté opposé le pneumothorax double, F. Bordet and F. Parodi, Section d'études scientifiques de l'Oeuvre de la Tuberculose, March 13, 1926, reported in Rev. d. l. Tuberc., June, 1926, vii, 469.*—*(A. P.)*

Intrapleural Pressures in Artificial Pneumothorax.—The object of this study is to emphasize the dangers of too great negative intrapleural pressures in pneumothorax treatment. They may be brought about by too small amounts of air at long intervals between refills. In cases of long standing, the X-ray studies may show a good collapse and yet the negative intrapleural pressure may be high. A case is reported in which the increased negative pressure brought about haemoptysis. Another case is recorded in which the increased negative pressure led to rupture of the lung followed by a pyopneumothorax.—*Unterdosierung bei künstlichem Pneumothorax, H. Maendl, Wien. klin. Wchnschr., February 24, 1927, xl, 250.*—*(W. I. W.)*

Significance of Holzknecht-Jakobsohn Phenomenon in Artificial Pneumothorax.—The difference in the views of Brieger and Brunner, as pointed out by Deist, regarding the pressure relations in the case of artificial pneumothorax, is dependent upon a misunderstanding. The Holzknecht phenomenon is not due to the greater negative pressure on the pneumothorax side, as suggested by Deist, but to a disturbed balance of the mediastinum, occasioned by the immediate response to volume changes in the thorax during inspiration, as a result of the entrance of the air into the bronchi on the healthy side.—*Über die Bedeutung des Holzknecht-Jakobsohnschen Phänomens beim künstlichen Pneumothorax (Bemerkungen zu der Arbeit von Deist, Brauer's Beiträge, lxiii, 4), E. Brieger, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 769.*—*(H. J. C.)*

Mediastinum in Spontaneous and Artificial Pneumothorax.—A case of spontaneous pneumothorax with exudate developed a hernia of the upper mediastinum. The heart was deviated to the right, and above this clinically and roentgenologically there was found gas, which had entered the mediastinum from the pneumothorax. The exudate was absorbed, but it recurred after a paratyphoid attack, when there developed fluid in the mediastinum (lying at a higher level) as well as in the pneumothorax space.—*Das Mediastinum im spontanen und künstlichen Pneumothorax. Ein Fall von spontanem Pneumothorax mit Komplikationen des Brustfells und Mediastinums, N. Oekonomopoulo, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 378.*—*(H. J. C.)*

Mediastinal Hernia in Artificial Pneumothorax.—For this term, introduced by Dumarest and Brette abroad, Eber has substituted the one *anterosuperior mediastinopleural pneumatocele*, as being more precise. The hernia is formed by the gaseous distention of one of the anterosuperior costomediastinal culs-de-sac insinuating itself into the zone formed by the intrapleural retrosternal ligament and premediastinal celluloadipose space containing the vestigial thymus gland. This pneumatocele is strikingly shown by fluoroscopy, increasing with expiration and diminishing with inspiration. It is characterized radiologically by the existence on the sound side of a dark, curved or crescentic line, its

concavity directed toward the mediastinum, limiting a clear zone (Dumarest and Brette). Eleven observations are cited, mostly in young girls, and four roentgenograms reproduced. *General Features:* (1) all were young subjects, (2) the phenomenon was equally distributed on both sides, (3) it appeared fairly early in all cases, the latest occurrence being nine months after beginning treatment, and (4) in no case did an exudate exist. The dimensions and visibility of the pneumatoceles varied, being greatest in expiration, and most visible at half-expiration. Rhythmical, pendular or balance movements were observed. There seemed to be little relation to the intrapleural pressure. Sometimes examination of the patient in the oblique position was necessary to bring out the pneumatocele clearly. The physical signs and subjective symptoms were variable. Anterior pneumatocele must be differentiated from pneumopericardium. The latter varies little with the respiratory phase. As for clinical significance, these pneumatoceles rarely require treatment other than the maintenance of the pneumothorax at low pressures. They usually disappear.—*Pneumatocèle médiastino-pleurale antéro-supérieure au cours du pneumothorax thérapeutique, E. Eber, Rev. d. l. Tuberc., October, 1926, vii, 778.*—(*A. P.*)

Displacement of Trachea and Oesophagus Following Artificial Pneumothorax.—Three young girls are presented, who, after completed and successful pneumothorax treatment for far-advanced pulmonary tuberculosis, showed a permanent deviation of the mediastinal organs. The bulging of the trachea is visible and palpable in the neck.—*Déviations de la trachée et de l'oesophage consécutives à des pneumothorax artificiels curateurs, E. Rist and F. Hirschberg, Meeting, Soc. Méd., d. Hôp., February 4, 1927, reported in Prog. Méd., February 19, 1927, no. 8, 295.*—(*M. P.*)

Pleuritic Exudates Complicating Artificial Pneumothorax.—It is difficult to establish precisely how the pleural reactions appearing in the course of artificial-pneumothorax treatment affect the results. Some have clearly a favorable effect, others are a temporary nuisance only, and still others constitute a serious obstacle, being associated with the development of new lesions or of adhesions which ultimately force the termination of treatment. Summed up, these pleural reactions seem to be a sort of inevitable ransom demanded in order to realize the more essential benefits of the treatment, whose great value no well-informed physician now contests. The most severe forms of pleurisy are really exceptional, yet this complication should not be underestimated as a cause of failure. The ameliorations which have been noted to occur are doubtless due to a more complete pulmonary atelectasis and cicatrization which are favored by the presence of exudate. It is unusual for an exudate to occur without rise of temperature and the usual constitutional manifestations of a general infection. The duration of symptoms varies, sometimes being sufficiently protracted and the symptoms sufficiently severe to cause the patient to lose much of the ground previously gained. Indirect consequences consist of pathological pleural changes and a development of adhesions, which often takes place within or beneath the fluid and causes progressive shrinkage of the pleural cavity. All sorts of clinical variations occur and the physician may be said to be the slave of these crises, the evolution of which he must watch without being able to influence them other than to attenuate their effects and retard undesirable consequences. Is there any way of avoiding these exudates or reducing their occurrence? The vast majority of them are of tuberculous origin and infection of the pleura seems to be rendered almost inevitable by the separation of its layers in pneumothorax. It is exceptional to find a healthy pleura in such a case. The insufflations often open up lesions, from which tubercle bacilli are discharged into the pleural cavity, and in cases in which a cavity is suspended by a thin adhesion which prevents its closure there is great risk of rupture. To try to avoid infection of the pleura altogether would mean giving up in 80 per cent of cases the effort to establish a useful pneumothorax. The factor of pleural pressure does however play a part, and the principle should be followed of getting the most favorable therapeutic results with a minimum of intrapleural pressure. Experience has shown that many lesions are cured without absolute collapse of the lung. Lesions may even evolve in the midst of fully collapsed parenchyma. Excellent results are often obtained by inducing a partial pneumothorax. Geeraerd has made it a practice to let up on compression as soon as the cardinal symptoms of active tuberculosis have disappeared: fever, constitutional disturbance, cough, expectoration. There is no relation between pressure and therapeutic effect. Experience shows that for each patient there exists an optimum pressure which will remain fixed for this individual patient for a variable period of time. A review of all the cases observed in four years at Buysinghen Sanatorium by Geeraerd shows the occurrence of exudates

in 40 per cent. *Treatment by Intrapleural Oxygen Injections:* Geeraerd was soon convinced of the value of this procedure as a defense against pleural infection. Symptomatic results are rapid: the temperature falls quickly, the evolution of the exudate is checked and in most cases it is rapidly resorbed or ceases to accumulate, allowing the usual nitrogen refills to be later resumed. These favorable effects are only noted in recent exudative crises and do not occur in longstanding cases. The same method of treatment is valuable in ordinary serofibrinous pleurisies not accompanying pneumothorax. The technique is simple. As soon as manifestations of exudate occur the pleura is emptied of gas, which is replaced by an equal or greater quantity of oxygen. As this is absorbed rapidly, daily examinations are necessary and, after twenty-four to forty-eight hours, a refill, repeated again usually at a two or three-day interval, and so on until the temperature has returned to normal, constitutional symptoms have subsided and fluid has ceased to reform. After this the nitrogen insufflations may be resumed. The essential point is precise and continued surveillance of the patient; to lose sight of him for several days may jeopardize the entire pneumothorax treatment by allowing adhesions to form between the pleural surfaces. Therefore it is practically essential that the patient be in an institution. Details of 20 cases observed are tabulated.—*Prophylaxis et traitement des épanchements pleurétiques compliquant le pneumothorax artificiel, Geeraerd, Rev. d. l. Tuberc., June, 1926, vii, 436.—(A. P.)*

Tubercle Bacilli in Pleural Exudates of Artificial Pneumothorax.—Most authors are of the opinion that such exudates are rich in bacilli, and some have noted granular forms, suggesting lysis, and interpreted them as manifestations of a pleural "Koch phenomenon." Verber has been able to determine the presence of tubercle bacilli on direct examination in 85 per cent of cases, but often it was necessary to examine several specimens of centrifugated sediment with much patience. The presence of other microörganisms does not exclude that of the tubercle bacilli, but as a rule they are not readily found in putrid exudates. Three categories of frequency are distinguished: (1) extremely bacilliferous exudates, 7 per cent, (2) exudates containing a few bacilli in most of the microscopic fields, 27 per cent, and (3) exudates in which only a few (2 to 5) bacilli can be found even in several preparations, 51 per cent. In large exudates accompanied by sharp constitutional reaction, if serous, one commonly finds but few bacilli (groups 2 and 3), lymphocytes and polynuclears. In purulent exudates they are usually numerous, often innumerable, free or enclosed in polynuclears, which are also numerous, either intact or altered. Some of these richly bacilliferous preparations resemble a pure culture. One is however struck by the marked fragmentation of the bacilli, which appear granular, like dust particles, although preserving more or less their acid-resistance. There is also a tendency to agglutination. There is a strong likeness to the phenomena observed by Rist, Kindberg and Rolland in exudates provoked by intraperitoneal reinfection in tuberculous guinea pigs. In these the bacilli stained poorly and in a granular fashion, and some of those contained in the leucocytes were merely shadows. These authors found in the cutaneous lesions, which showed the Koch phenomenon, groups of bacilli, often phagocytosed, which had almost lost their acid-resistance and stained a violet-brown with carbol-fuchsin. They concluded that most of the bacilli of the provoked peritoneal exudate were destroyed, as often large quantities of the exudate failed to infect guinea pigs. In the case of the pleural exudates observed, animal inoculation was almost always positive, but many have thought that there was a diminution in virulence, and cultures are rarely positive. In this case we have to deal, not with a suddenly provoked reinfection, but more probably with a series of reactions to repeated minimal inoculations of the pleura. *Conclusions: 1:* In pleural exudates in the course of artificial pneumothorax one finds tubercle bacilli in most cases, sometimes in great abundance, especially in recent exudates with severe constitutional reaction, and turbid or purulent ones. *2:* The bacilli diminish or disappear in cases of favorable evolution, even though the exudate persists. *3:* There may very likely exist diastatic bacteriolytic substances in these exudates, acting *in vivo* on the bacilli without dissolving the waxy coating or envelope.—*Recherches sur la frêquence et la morphologie du bacille tuberculeux dans les épanchements pleuraux au cours du pneumothorax thérapeutique, T. Veber, Section d' études scientifiques de l' Oeuvre de la Tuberculose, December 12, 1925, reported in Rev. d. l. Tuberc., February, 1926, vii, 117.—(A. P.)*

Spontaneous Pneumothorax Following Unsuccessful Attempts at Artificial Pneumothorax.—In 7 cases reported by the author spontaneous pneumothorax occurred shortly after attempts at artificial pneumothorax. In some of the cases symptoms were lacking and fluoroscopy revealed

the pneumothorax; in others the pneumothorax operation was followed by pain and mild dyspnoea. Infection of the pleura did not occur in any case and the therapeutic result was satisfactory in all of them.—*Über Spontanpneumothorax nach erfolglosem Versuch den Künstlichen Pneumothorax anzulegen, A. Walser, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 373.—(H. J. C.)*

Blood Sugar in Artificial Pneumothorax.—After each injection of air in artificial pneumothorax, there is a moderate but constant rise in the blood-sugar, due to diminished pulmonary ventilation. This increase is noted two hours after the procedure, and slowly and gradually becomes greater within the next 24 hours. Approximately one day after the introduction of air the glycaemic value drops to its former level. The increase in the sugar content of the blood bears a direct relationship to the amount of air given. The more air introduced, the higher the sugar curve. Following bilateral pneumothorax there is a marked increase in the glycaemia because of the greater disturbance in respiratory function. During subsequent refills the blood sugar shows the same tendency to increase. These changes are in no way due to the tuberculosis, but depend upon changes in the respiratory mechanism. In one case of gangrene of the lung, pneumothorax therapy was instituted and the glycaemia was increased just as in patients with pulmonary tuberculosis.—*Comportamento della glicemia nel carso del pneumotorace artificiale, T. Lucherini, Tubercolosi, March 1927, xix, 97.—(U. E. Z.)*

Technique of Oleothorax.—This procedure introduced into medical practice by Bernou, an "oily blocking of the pleura," is a thing quite different from the ordinary intrapleural injection of a few syringefuls of antiseptic oil, long known and practised. Oleothorax finds its chief antiseptic field of usefulness in septic pleurisies and spontaneous pneumothorax. It is still in the experimental stage. *General Considerations:* The production of an oleothorax consists in filling the greater part or whole of the pleural cavity with an oily liquid, non-irritating, which is to exercise a mechanical, and often also an antiseptic action. It is used both in the presence of pleural infections and preventively in cases in which tubercle bacilli are likely to be set free in the pleural space, either from the traumatization of adhesions by gaseous distention or from retrograde infection from the subjacent lung. Bernou employs vegetable oil as a solvent, as do most physicians, but he has suggested that the inconvenience of too rapid absorption of olive oil could be avoided by the substitution of paraffin oil, which Küss prefers for these reasons: (1) ease of procuring a pure product, (2) ease of sterilizing at high temperature without special precautions, (3) high viscosity, (4) unalterability in the pleura, and (5) slowness of pleural resorption. Such a compressive oleothorax can best be obtained with paraffin oil, injected at infrequent intervals, about 8 to 75 cc. being absorbed in a month in the presence of abundant exudate. However, such slow absorption is not to be desired in disinfectant oleothorax, when there exists a septic or richly bacillary exudate. A more rapidly absorbable vegetable oil is here to be preferred, namely, gomenolated vegetable oil, which also gives off rapidly to the infected pleura its dissolved antiseptic, and new doses can thus be reinjected. On the contrary, gomenolated paraffin oil reretains a large part of the *Gomenol* and is less reliable for disinfectant purposes. The usual antiseptic employed is *Gomenol*, which possesses a notable bactericidal power toward the usual pathogenic microörganisms, including tubercle bacilli, has very little toxicity or causticity, and can be injected in 4 or 5 per cent strength into the infected pleura in total quantities of 400 to 600 cc. of oil. The odor of *Gomenol* is perceived by the patient in the expired air for one or more days, but the greater part remains in the pleura and can be withdrawn after several months. *Precautions and Technique:* In a healthy pleura, following Bernou, one begins with a small preliminary injection of 10 to 20 cc., in order to avoid a painful and febrile pleural reaction. If there are any signs of intolerance, slowly progressive doses are employed. When any considerable quantity of oil is injected it should be heated to 38°C., as the injection of a large mass of unheated oil would cause a chilling of the pleura, possibly harmful. The heating also facilitates the passage of the oil through the narrow channels of the needle and connections. The case is entirely different from heating the gas before introduction, which has no practical or theoretical value. The oil, when injected at atmospheric pressure or above, runs out and tends to collect in the tissues of the thoracic wall. Thus liquid tumors may form and give rise to an aseptic inflammation or slightly painful indurations. Spasms of coughing or muscular efforts are instrumental in provoking this egress of oil. When this occurs reinjections are often rendered difficult and painful. Two precautions serve to prevent this: (1) the use for twelve to twenty-four hours of a compression bandage, and (2) the employment of needles or trocars of a proper calibre.

Poiseulle has established definite laws governing the flow of liquids in capillary tubes, and Bouasse summarizes these in the following formula: $Q = \frac{11}{8v} \frac{Po - Pl}{L} R4$, when Q represents the output, v the coefficient of viscosity, $Po-P$ the loss of force from the entrance to the exit of the capillary tube, L the length of the tube, and R its radius. Thus, the needle or trocar must be of just the necessary length, and above all of the largest acceptable diameter. The large sizes favor tuberculomata of the chest-wall and pleurocutaneous fistulas. Küss finds most serviceable trocars 43 mm. in useful length, 70 mm. in effective length, 1.5 mm. in external diameter, and 1 mm. in internal diameter. With few exceptions these are sufficient for the evacuation of any exudate. The most common difficulties in evacuation do not depend so much on the size of the trocars or the blocking of the cannular extremity by floccules or membranes floating in the liquid and drawn in by aspiration. These can be removed by passing a stilet. Stoppage of the flow may also be due to a thick deposit of membrane or purulent debris in the costovertebral gutter. The use of trocars of very large calibre has not been found of advantage in removal, and most certainly exposes the patients to the danger of infiltrations of the chest-wall in the presence of elevated pleural pressures. Moreover, in most cases needles should be preferred to trocars, as they are shorter and less traumatizing; they should have as thin walls as possible and stilets should be provided. Küss's no. 1 size has 1.2 mm. external and 1 mm. internal diameter, no. 2 0.9 mm. external and 0.7 mm. internal. The smaller size is used in the presence of strongly positive intrapleural pressures. Tables are given showing the rapidity of flow of gomenolated paraffin under a constant pressure with needles of varying dimensions. The following conclusions are derived: *1:* The influence of the length of the needle on the flow is considerable. As short needles as possible should be used. *2:* The influence of the pressure is almost proportional to the pressure, but, practically, one atmosphere is sufficient and is borne without risk to the apparatus. *3:* The influence of internal calibre is most important, following Poiseulle's formula. Actually no. 1 needles suffice for copious injections, and, with the oil at 30 to 35°C., allow a flow of 50 to 65 cc. of 4 per cent gomenolated oil per minute, or 600 cc. in 9 to 12 minutes. No. 2 needles require 35 minutes for similar injections. The gomenolated paraffin oil used may vary in strength from 2 to 8 per cent and is preferably prepared by the user. The paraffin oil must be of good quality, neutral, density 0.88 at 15°C., viscosity 14 times that of water, limpid, and nonfluorescent. It is sterilized in the original flasks by heating for 15 to 20 minutes at a temperature of 150° to 170°C. after removing 8 per cent of the contents to allow for expansion, then cooled, and the gomenol added. The mixture does not become entirely clear for several weeks or months, but solution is aided by keeping it in a warm place. For large injections glass cylinders of 350, 650 or 950 cc. are used, graduated, with an upper tubular attachment for use of compressed air, and connected with a 2-litre bottle, in which can be produced a vacuum or a compression of one atmosphere. This bottle receives rubber tubing of 3 mm. internal and 8 mm. external diameter, in which is fixed a stopcock adaptable to either trocar or needle. The pressure or reverse is produced by a little pump and controlled by a manometer. The cylinders are fixed on a support similar to that for pneumothorax and held fast by bands. They are sterilized at 160° to 180°C. in a gas-heated retort. The rubber tubing is boiled, and then interposed between the cylinder and the pump, and a sterile cotton filter inserted. The cylinders are filled by aspiration from an aseptic flask of the oil. The rubber tubing must be solidly fastened. *For smaller injections*, not over 200 cc., a specially constructed 55-cc. syringe is used with a metallic piston. The contents of the syringe can be evacuated through needle no. 1 in 1 minute, 20 seconds. The syringe is attached to a right-angled stopcock, connected by tubing with flask and needle. Useful accessories are a fixed clamp for holding the needle in place and a swan-neck stopcock, when for some reason the tubing must pass at right angles to the needle. With this in use the tubing can be fastened by adhesive tape to the chest-wall. An oleothorax is created at one or several sittings according to the size of the cavity to be filled. Not over 650 cc. should be given at a sitting. If a pneumothorax exists, gas should be withdrawn as oil is given, using a separate needle, no. 2 size. Before withdrawing the needles the patient's comfort must be ascertained. For repetition of injections, the syringe method is used and the pressure can be determined simultaneously by the use of a small side-tube as a manometer. Pressures of 15 to 30 cm. are often tolerated very well if attained gradually. For *replacement of exudates* by oils, a trocar connected with a two-way stopcock may be used. Small repeated aspirations and injections are performed until oil begins to appear in the aspirating bottle. A preferable method is to empty the chest at the

first sitting through a trocar passed in the lower dorsal region, and simultaneously to introduce air through a separate needle introduced anteriorly. At a second sitting air is aspirated with the pneumothorax apparatus while oil is injected separately. The intrapleural pressure should always be observed. In disinfectant oleothorax, the following must be done: (1) Use strongly gomenolated vegetable oil; (2) remove the infected liquid as completely as possible, with the simultaneous introduction of air; (3) rinse the pleura with sterile physiological saline solution, and (4) inject oil in sufficient quantity. Burnand claims almost constant success with this technique in septic pyopneumothorax and acute septic-tuberculous pleurisy.—*Technique des oléothorax, M. G. Küss, Section d' Études Scientifiques de l' Oeuvre de la Tuberculose, November 14, 1925, reported in Rev. d. l. Tuberc., February, 1926, vii, 101.*—(*A. P.*)

Effects of Oleothorax.—In 1918 Weill reported the use, in cases of pyothorax, of repeated small injections (5 to 20 cc.) of 20 per cent gomenolated oil. Since then it has been found feasible to use much larger amounts, and the thickened pleura is remarkably tolerant. A thin layer of oil above a purulent exudate cannot have sufficient contact to be very effective, and may retain its gomenol almost intact. These considerations have led to the use of larger quantities and a proportion of gomenol up to 20 per cent. To such massive intrapleural injections has been applied the term *Oleothorax*. This procedure may also be applied in the case of certain pulmonary perforations, as well as to check the formation of adhesions in the course of therapeutic pneumothorax, and possibly to prevent or supplement certain surgical procedures (pleurotomy, phrenicotomy, thoracoplasty). *1: Oleothorax and Pleural Exudates:* In simple serofibrinous pleurisies the method is at best useless and our chief concern is with tuberculous pyothorax. Such cases can be grouped as either "tolerated" or "malignant," following Dumarest. In "cold" tuberculous pleurisies, the suppurative process is usually rapidly arrested by oleothorax, sometimes by a single treatment. To avoid recurrence it is necessary to maintain the oily antiseptic bath for a sufficient time. Many of these cases however, as Bernard has shown, result simply from an aging of a serofibrinous exudate. The real indication for oleothorax is seen in cases of pyothorax, which are accompanied by marked febrile reaction, indicative of persistent activity of the tuberculous process in the serosa, often ending with caseous transformation of the pleura and a richly bacilliferous exudate, or else in pleuropulmonary perforation. In such cases oleothorax may prevent the transportation of bacillary emboli from a pleural or subpleural focus to the opposite lung, where they may give rise to a miliary or acinous exudative tuberculosis, apparently of haematogenous origin. Also, the use of oleothorax brings about a rapid transformation of the patient's general condition: return of appetite and strength, increase in weight, etc., doubtless due to a checking of bacillary activity and diminished toxic absorption, also release of pressure due to the weight of the exudate. In the originally grave hectic or "malignant" cases of pyothorax, perseverance sometimes achieves remarkable results, but repeated punctures and injections may be necessary. *Tuberculous Purulent Pleurisies associated with Secondary Infection* are of grave import, and the prognosis is not favorable when pleurotomy is done, as a persistent fistula remains and leads to death from amyloid degeneration and cachexia. In such cases oleothorax deserves trial. It may at least improve the patient's condition for a later thoracoplasty. *Primary Tuberculous Purulent Pleurisies*, especially if simple aspiration and replacement by pneumothorax fail to achieve success, should be treated by oleothorax before too great a thickening of the pleura has occurred. *Acute Nontuberculous Pleurisies* may respond favorably and may be treated by oleothorax before resorting to pleurotomy. The mode of action in purulent pleurisies appears to be through inducing a vascular congestion and proteolysis at the site of the lesion; also, some saponification occurs, and absorption of lipases may increase the blood-lipase titre, commonly diminished in tuberculosis. Indeed, an important resorption of oil has been found to be accompanied by a strong lipase reaction. There may be some lymphatic blocking, which discourages the propagation of the tubercle bacillus and limits toxic absorption. A secondary favorable effect is purely mechanical, due to removal of the weight of the exudate, relieving digestive and other functional disturbances. The failures that occur are probably due to a severe caseous evolution in the lung itself extending to the cortex, or in some cases to a greatly thickened pleura, minimizing the effects of the oil. There are also failures due to faulty technique, in turn due to careless or too infrequent observation. *2: Oleothorax and Pleuropulmonary Perforations:* Such cases constitute the prime indication for oleothorax. Perforations may be divided into (1) valvular, (2) transitory and (3) permanent. The latter may be subdivided into

large and small. Weill especially has obtained favorable results in the first type and followed the subsequent expansion of the lung under oil. There is an unusual type of valvular pneumothorax, with inverse opening, in which air is aspirated from the pleural cavity with respiration; in such cases oleothorax is often very successful. The diagnosis of perforations is often quite a delicate matter. Microscopic examination, when the entrance to the fistula is concealed, may show the similarity between the sputum and pleural pus, while injection of methylene blue, recommended by Bernard, may show a communication; it may not, however, appear in the sputum for weeks or months. Manometric signs cannot be counted on too much, as an occlusion of the lips of the fistula may obstruct the passage of air. Another type of perforation is shown only after evacuation of the pus, which may press together the edges of the fistula. Intermittent fistulization, untreated, may lead to more extensive ruptures, whereas an oleothorax checks suppuration, modifies the serosa, and hastens cicatrization. Endogenous perforations offer the least chance of success of any. In most cases of permanent perforations thoracoplasty must be recognized as the treatment of choice, especially when the fistula is large; in these last cases oil injection is useless, the oil being immediately expelled. In the case of incomplete encysted pneumothorax and narrow oblique fistula oleothorax may bring about a cure, providing the pleura is still supple as in the early part of pneumothorax, and adhesions do not interfere with closure. Burnand has reported two striking successes. Burnand has also employed oleothorax following thoracoplasty in fistulous cases, instead of pleurotomy. *Oleothorax and Pleural Adhesions:* There is no question of attempting to break the adhesions, as Holmgren has done with oleothorax, but rather is it sought to extend and preserve the pleural space, and check adhesion of the pleural layers which may follow a pleurisy. Paraffin oil is for this purpose preferable to olive oil, and the gomenol need not be in very strong proportion. Radiological control or exploratory puncture will determine whether new exudate forms or the pressure becomes too high. Also in certain pneumothorax cases far from observation, oleothorax has been substituted and is well tolerated. *Technique: 1: For pleural disinfection:* It is first essential that all aspiratable pus be withdrawn, in order to prepare for the "complete antiseptic bath" of the serosa. For the same reason one should not delay too long in evacuating newly formed pus and replacing it by the antiseptic oil. There is no fixed relation between the amount of pus withdrawn and oil injected, but overpressure must be avoided. This is usually manifested by pains, coughing and a sense of suffocation. The pressure may surpass 75 cm. of water. Another precaution to be observed is not to puncture a pyothorax too low, especially an old one, in which case there are apt to be adhesive neoformations. Either the method of *discontinuous substitution* or that of *continuous substitution* may be employed, using two trocars for the latter. Burnand recommends a preliminary lavage with saline solution before injecting oil. This should be repeated until the returned liquid is clear. It is not indispensable but has the advantage of removing débris. Either lateral decubitus or sitting posture may be used. A flowing back or escape of the oil is favored by overpressure, especially in persons with thin chest-walls. To avoid fistula it is well to inject a few drops of iodoform-ether, to use a small trocar, about 0.15 mm. in diameter, and to advise the patient to remain lying for several hours after the injection on the better side. Although a 20 per cent strength of *Gomenol* may be used without harm, a smaller dose, 5 to 8 per cent, is practically sufficient. Olive oil should be the excipient in all cases in which there is exudate. The oil becomes opalescent after injection, due to saponification. In pleuropulmonary fistulous cases the oil must compress the orifice. It may be necessary to alter the patient's position during injection. A "virgin pleura" may react violently with febrile symptoms and in such a weak initial dose should be used. *Conclusions:* Oleothorax, applied with proper precautions, is of great service in certain cases, especially of tuberculous pyothorax, and may make a pleurotomy or thoracoplasty unnecessary. It is also of value in arresting pleural symphyses. Careful individualized technique must be followed.—*Contributions à l' étude des injections huileuses massives dans la plèvre, A. Bernou, Rev. d. l. Tuberc., June, 1926, vii, 345.—(A. P.)*

Oleothorax with Gomenol.—This method or procedure, introduced by Bernou, is effective in several circumstances in which those of Potain and Forlanini are impotent. There are certain difficulties, risks and contraindications, yet its value, especially in the treatment of purulent pleurisies, is assured. Harmful reactions are due to (1) irritant action of the *Gomenol* on the pleura, (2) distention of pleural adhesions by the oil, and (3) overpressure. *1: Gomenol* irritating in the pure state, is admirably tolerated in an oily solution, as when in-

corporated in vegetable oil or paraffin. Strengths over 7 to 8 per cent are unnecessary, even in pyopneumothorax, and 4 to 5 per cent suffices for tuberculous pleurisy without secondary infection. In cases in which a simple mechanical action is desired, 2 to 3 per cent may be used for prophylactic purposes. In pleural cavities occupied by well-stabilized chronic pyothorax, gomenolated oil may be injected in high doses without danger. On the other hand, in cases in which a relatively recent exudate has developed rapidly, even 4 per cent gomenolated oil may excite a violent reaction. The usual thermic reaction is a sudden sharp elevation, reaching its peak in a few hours, and descending gradually in staircase fashion. In such cases *Gomenol* should not be used. In cases with a healthy pleura or an exudate absorbed within a few months, one may begin with 2 per cent strength. *2:* At the beginning of a compressive oleothorax one risks provoking reactions by stretching adhesions and setting free bacilli from the rupture of small pleural or subpleural tubercles. The prudent plan is not to begin with any greater pressure of oil than formerly was used with gas. *3:* The pleura can be filled without the use of strong mechanical pressures which should be avoided. Each case has its own optimum pressure, which must be determined and controlled. One must be prepared to aspirate if necessary to relieve overpressure.—*Discussion sur l'oléothorax, G. Küss, Section d'études scientifiques de l'Oeuvre de la Tuberculose, May 8, 1926, reported in Rev. d. l. Tuberc., August, 1926, vii, 649.*—(*A. P.*)

Modified Thoracoscopic Cautery.—An instrument is described which has the following advantages over Jacobaeus's and Unverricht's thoracoscope. The cauterizing instrument is contained in the same instrument with the illuminating part, thus necessitating only one thoracotomy instead of two. In addition to the optical part and the cutting attachment, the instrument contains a wire spiral, which allows holding adhesions in a fixed position. The cutting is effected not by the actual cautery but by electrocoagulation, eliminating in this way all danger of haemorrhage. The entire instrument, including the cables, can be sterilized by boiling. Large and fibrotic adhesions are not easily separated by this instrument; further improvements are promised for the near future.—*Ein neues Instrumentarium zur Operationsthorakoskopie, H. Maendl and E. Kormitzer, Wien. klin. Wchnschr., October 13, 1927, xl, 1288.*—(*M. P.*)

Thoracoplasty with Artificial Pneumothorax on Opposite Side.—A patient is presented on whom a thoracoplasty was performed 2 years ago. On account of a cavitating lesion on the opposite side pneumothorax was established. During the two months of pneumothorax treatment the results were satisfactory, the patient not being short of breath, the sputum having diminished two-thirds, and the temperature being normal.—*Création d'un pneumothorax artificiel sur le côté de la poitrine opposé à une thoracoplastie, P. Ameuille, Meeting, Soc. Méd. d. Hôp., March 11, 1927, reported in Prog. Méd., March 26, 1927, no. 13, 480.*—(*M. P.*)

Thoracoplasty Versus Artificial Pneumothorax.—The results of artificial-pneumothorax treatment are decisive and satisfactory, so that in pulmonary-collapse therapy we should not waver. In certain cases pneumothorax alone is indicated. Thoracoplasty should be considered only when pneumothorax does not suffice or when it is not attainable.—*Dürfen wir in der Lungenkollapstherapie zu Gunsten der Thorakoplastik auf den Pneumothorax verzichten? A. Schoop, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 327.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with Thoracoplasty.—Although for fifteen years or more the Germans, Swiss and Scandinavians have recognized the beneficial results of this procedure, first carried out by Friedrich at Marburg, Germany, in 1907, at Brauer's instigation, it is only in the last few years that the rest of the world has become familiar with it. Archibald in 1912 was the first North American surgeon to take it up. In this type of thoracic surgery the greatest coöperation between internist and surgeon is required, although the ultimate responsibility must rest with the surgeon. As far-advanced unilateral pulmonary tuberculosis is a rarity, it seems correct to operate provided the process in the better lung is of limited extent and especially that it is restricted to the apex. The determination of activity in the better lung is difficult and may require repeated observation. An unsatisfactory pneumothorax is an indication. Combined partial thoracoplasty and partial pneumothorax are not to be specially recommended. Patients with very large cavities are not as suitable as they might have been if operated on earlier. Operation is especially indicated in lesions of the lower lobe, and in the case of repeated severe haemoptysis when pneumothorax cannot be done. Fibrocavernous forms of disease with contraction are suitable, as are

those progressive forms associated with much sputum; also certain cases in which there is much mediastinal retraction and the lung remains small and atelectatic following prolonged use of pneumothorax. Closed tuberculous empyema without secondary infection requires operation following preliminary aspiration. *Technique.* All four of the pioneers in thoracoplastic surgery (Friedrich, Sauerbruch, Wilms and Brauer), eventually arrived at a form of operation more or less similar in essential features. Some years ago local anaesthesia was regarded as ideal, although Sauerbruch still used ether, but the present tendency is toward a general anaesthetic with or without a local one. The possibility of aspiration may be minimized by having the patient previously empty the cavity by coughing. Patients operated on under only local anaesthesia are apt to be very apprehensive and suffer much mental anguish which is not good for them. Also, the time of operation is shortened by the use of a general anaesthetic. It is safest to operate in at least two stages. The upper part of the operation is more difficult, and this might seem to be a good reason for doing it first. The first rib is most difficult to remove, and in some cases it might be left, but many surgeons consider its resection most important. The result of alcoholic injections of the intercostal nerves to relieve pain are not impressive. Phrenic-nerve avulsion is recommended by some as a necessary preliminary, but as good results are to be obtained, with as high ascent of the diaphragm, when sections of the 9th to 11th ribs are removed. The longer the sections removed from the ribs the greater the collapse, although, as Lilienthal has pointed out, the greater obliquity of descent of the ribs plays an even greater part, similar to the action of a Venetian blind. Removal of too long sections may cause mediastinal flutter and cardiac embarrassment. The degree of shock experienced varies, as does the interval between stages also; ordinarily it should be about two weeks. Following the first stage there may be little or no symptomatic change but in favorable cases this should be apparent within a week after the completed operation. *Apicolysis* is useful only when a large apical cavity exists with little disease elsewhere. It may also be performed as a secondary or auxiliary operation to thoracoplasty. The space created by the extrapleural pushing down of the apex is filled with pectoral-muscle flaps or fat from the abdominal wall or buttocks. Some surgeons use gauze packing. Jacobaeus's intrapleural technique for cauterizing and severing adhesions seems to entail too much risk of haemorrhage and infection. *Results of Surgery:* These are amazing when one considers the poor condition of the patients. An operative mortality of 4 to 5 per cent is to be expected (Whittemore's is 7 per cent). Alexander's summary of one-third cured, one third improved and one-third unimproved or worse, is a concise statement of the expected end-results.—*Thoracoplasty in Pulmonary Tuberculosis, W. Whittemore, Boston M. & S. J., January 6, 1927, cxcvi, 1.*—*(A. P.)*

Results of Thoracoplasty.—The results, as told by statistics and by comparison with induced pneumothorax, warrant the use of thoracoplasty in a certain group of patients, namely, those unable to be given pneumothorax because of adhesions, and others who have obtained a partial but unsatisfactory collapse with pneumothorax. The basis for the claim for the more frequent use of this treatment is founded not only upon the statistics of others but also upon an experience of ten years, in which time 157 cases have had thoracoplasty performed at the Vejlefjord Sanatorium in Denmark. Records of 157 thoracoplasty patients discharged from this sanatorium show 36 much improved, 67 improved, 21 stationary or worse and 27 dead. The positive results are divided into two groups. The group containing patients "much improved" are those without symptoms; while the "improved" group contains those in which an undoubted but less marked improvement has taken place. The latter patients were able to walk about without fever and some had negative sputum. It is thus seen that the so called "positive" results were obtained in 68.2 per cent of all cases operated upon, and negative results in 31.8 per cent. By way of comparison with the 1,159 cases compiled by Alexander, it is noted that positive results were obtained in 664, or 61.3 per cent, and negative results in 420, or 38.7 per cent. Brunner's statistics show positive results in 75 cases, or 64 per cent, and negative results in 32, or 36 per cent. The reason offered for the better results at the Vejlefjord Sanatorium is that the patients were operated upon within the Sanatorium, without any break in the Sanatorium regimen. An idea of the duration of the results may be obtained from a study of 131 patients already discharged from this Sanatorium one to ten years after operation:

Fit for ordinary work, 34\ 53, or 40.5
Fit for easier work, 19/ per cent
Unfit for work, 15, or 11.5 per cent.

Death from tuberculosis (including operative deaths) 59, or 45.0 per cent.

Death from other diseases, 4 or 3 per cent.

It is seen that about 40 per cent of the patients are able to work. This figure com-

pares favorably with the permanent results of induced pneumothorax, in spite of the fact that the disease as a rule is much more extensive in those patients who have thoracoplasty than in those treated by artificial pneumothorax. The majority of the patients had a complete thoracoplasty. The guiding principle in all cases was to transform the chest into that shape thought to provide the best condition for healing of the lesions. It is emphasized that thoracoplasty undoubtedly enhances the prospects of a group of patients whose outlook without surgical interference is anything but good.—*Results of Thoracoplasty in Phthisis, J. Gravesen, Lancet, October 2, 1926, ccxi, 702.—(H. M. R.)*

Mechanism of Phrenic Exairesis.—Phrenic exairesis does not put the lung at rest, and the results in pulmonary tuberculosis after the use of this method must be explained by other means. In dogs with unilateral phrenic exairesis there was no diminution in the minute volume of the operated side as compared with the normal side, which appeared to the author to make this explanation even more difficult of experimental proof.—*Zum Wirkungsmechanismus der Phrenicusexairese, L. Dünner and M. Mecklenburg, Ztschr. f. Tuberk., 1926, xlvi, 406.—(H. J. C.)*

Actinotherapy in Tuberculosis.—*Physical Characteristics of Light:* All wavelengths of radiation possess some heat properties, but chiefly the infrared and the red rays. Light is associated chiefly with the rays from red to violet, while the ultraviolet rays are the most active chemically. Quartz, fluorite glass and clear distilled water do not absorb ultraviolet rays. Ordinary window-glass absorbs all ultraviolet radiations shorter than 320 millimicra, while vitaglass transmits 65 per cent of these rays at 320 millimicra. Ultraviolet rays between 320 and 290 millimicra are the best pigment-producing rays. *Photobiological Effects:* Red and infrared rays produce an immediate but transient hyperaemia. Infrared and visible rays dilate the superficial capillaries and increase the flow of blood and lymph, but do not destroy cells. Ultraviolet rays are rapidly absorbed to a depth of less than 1 mm. and produce marked chemical changes. Haemoglobin, as well as blood-serum, absorb these rays. Those necessary for the prevention of rickets and production of erythema are below the region of 320 to 313 millimicra. The bactericidal effect of these rays is more marked as the wave-length decreases. Ultraviolet rays also have a destructive or stimulating effect on protoplasm, egg and serum-globulin being formed from albumin. On repeated exposures to these radiations, melanin is formed in the basal cells of the epidermis. Unicellular organisms may be either stimulated to fusion or destroyed, depending on the intensity of the irradiation. Cholesterol, found in large quantity in the skin, is activated chemically and endowed with antirachitic power through ultraviolet irradiation, which also renders the milk of the pregnant mother antirachitic. Radiation, particularly with high-amperage carbon arcs, may increase the red blood cells and haemoglobin in anemia, and the apparent benefit to the patient in rickets and tetany is probably due to increased absorption of calcium from the intestines. Cell membranes and capillaries develop increased permeability, and the coagulation time is decreased. Basal metabolism is increased very slightly by light exposures alone, but can be much increased by exposure to moving air. Mineral metabolism is definitely increased, and also the physiological action of the skin, while muscular tonus may be rapidly produced in unused muscles. The action of light on the body is an indirect one, and does not depend on deep penetration, most of the rays being absorbed by the epidermis alone. Light application loses its best effects unless a moving current of air can be obtained at the same time, producing increased heat radiation and conduction. *Sunlight versus Carbon Arc and Mercury Arc:* Midday sunlight emits ultraviolet rays from 300 to 297 millimicra, the visible and infrared emission being high. Radiations having spectrum components like those of sunlight have been most successfully used in heliotherapy, and sunlight has the advantage of inducing favorable psychic reactions. Superficial forms of tuberculosis, however, should respond better to more intense short-wave ultraviolet radiation than exists in sunlight itself. The quartz mercury-vapor arc-lamp emits a preponderance of ultraviolet energy in relation to its total output, the ultraviolet rays in sunlight being from one to five per cent only of the total energy output. Quartz allows the transmission of rays from 185 to 320 millimicra which are not transmitted by window-glass, and the intensity of emission is greatest after the first five minutes' operation of the lamp. The spectral components of the carbon-arc are similar to sunlight, but vary in intensity according to voltage and amperage, the diameter and composition of the carbons. The arc of 3 to 10 amperes is of value in local applications; those of 20 or more amperes are of more value in general exposures of the body. High amperage lamps (50 to 125 amperes)

are used for groups of patients, twelve or more at a time. The open carbon-arc is more effective than the enclosed. Carbons impregnated with iron, tungsten and nickel emit rich ultraviolet zones down to about 220 millimicra. The development of ultraviolet pigmentation is independent of that of tolerance, and ultraviolet tolerance is possible without pigmentation, and it is not generally accepted that increased pigmentation necessarily means an increased tendency to healing. *Dosage:* The dosage in therapy is largely dependent on the intensity of wavelengths from 313 to 250 millimicra and cannot be fixed. Different areas of the body vary greatly in sensitiveness to radiation. Some workers prefer erythema only, others stress the desirability of pigmentation. Eidenow and Hill aim at mild erythema with each dose, using short and intense exposures to produce this effect without overheating the body. During desquamation of certain areas, several days elapse before further exposure. When the skin becomes insensitive to mercury-arc radiations, the long-flame carbon-arc is used. Their dosage has regularly produced increased bactericidal power of the blood. Rollier aims, however, for pigment production. Overdosage of light may produce injury, causing decreased bactericidal power of the blood, malaise and fatigue. In tuberculosis light may set up focal reactions similar to those of tuberculin. In most forms of progressive acute tuberculosis, heliotherapy is not indicated, although intestinal tuberculosis creates an exception. With sunlight the dosage is gradually increased over increasingly large areas of the body according to Rollier's technique, the heat of the day and chilling winds being avoided. With plain carbon-arcs, the dosage is increased fifteen minutes daily to a maximum of two hours, the lamps placed at a distance to avoid the heat. With impregnated carbons, one can regulate dosage by watching for erythema and constitutional reaction, using very small exposures at first, and increasing to a maximum of twenty minutes. The author, using a mercury-vapor quartz light, alternating current of 5 amperes, and voltage of 110, begins with three minutes at a distance of 36 inches, two exposures front and back, and a fifth exposure directly over the area of disease. One minute is added daily until a maximum of twenty minutes is reached, the room temperature being kept at 70°F., and moving air employed. The burner is then lowered one inch daily until it is 18 inches from the skin. *Clinical Results:* With solar exposures the best results have been obtained with the pretuberculosis of children, and with tuberculosis of the lymph nodes, pleura, bones and joints, peritoneum and intestines. With carbon-arcs the best results are reported with cutaneous, bone and joint, lymph-node, laryngeal, peritoneal and ocular tuberculosis, less favorable being the reports on pulmonary, genitourinary and intestinal tuberculosis. In the author's own experience with the quartz mercury-vapor light the best results were obtained in intestinal tuberculosis, resulting in many cases in gradual disappearance of marked filling defects as revealed by the X-ray. Good results were also obtained with "hilum glandular" tuberculosis, cutaneous, oral, laryngeal, ocular and peritoneal tuberculosis. Results in bone and joint and genitourinary tuberculosis were not so favorable. Artificial radiation in pulmonary tuberculosis is not to be encouraged.—*The Fundamentals and the Clinical Aspects of Light Treatment, E. Mayer, J. Am. M. Ass., July 30, 1927, lxxxix, 361.*—(*G. L. L.*)

Measurement and Dosage of Sun's Rays in Heliotherapy.—There is no unquestioned method of gauging the dosage of sun-raying, which can only be attained by the coincident determination of the time and intensity with consideration of the type of rays that are present in the source of light, as well as the size of the rayed area. On the basis of personal experiences in the tropics the author expresses a desire for a satisfactory measurement of intensity in sun treatment in order to avoid overstepping the active dose and in order to still be able to utilize a satisfactory active dose. Measuring of the short-frequency rays is difficult, and this explains the inability to fully understand their action in the treatment of tuberculosis. The various methods of measuring the intensity of the sun's rays, including the photographic, the photochemical, the photoelectrical, the use of the selenium cell, and the pyrheliometer, and their drawbacks, are reviewed. The author recommends the use of a spectrographic method, for which an instrument is being perfected at the Zeiss factory.—*Über die Messung und Dosierung der Sonnenstrahlen in der Tuberkulosebehandlung, H. W. Knipping, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 180.*—(*H. J. C.*)

Heliotherapy in Surgical Tuberculosis.—External tuberculosis is not a local disease requiring only local treatment, but a general disease with local manifestations and requiring general treatment. Heliotherapy in tuberculosis includes the use of both sun and air, and may be employed at sea-level or at higher altitudes. Through the development of pigmentation the skin gains an increased resistance to heat and cold,

as well as to microbes such as cause acne, furunculosis, etc., and a capacity for the early scarring of wounds. Suncure stimulates pulmonary and circulatory activity, increases the appetite, and exerts a favorable influence upon digestion and the endocrine system. Destroyed areas in bone (from tuberculosis) undergo repair, and normal tissue is sometimes restored, and this irrespective of whether the diseased part itself is actually exposed to the sun's rays. But suncure requires a great deal of individualization. Exposures should be begun on a small portion of the body and be of but short duration. In warm weather exposure should be made in the early morning hours. The most important piece of apparatus is the bed, which should be high, on wheels, and provided with a hard spring-mattress. Patients should be encouraged to employ their hands and minds by basket and toy-making, wood work, etc.—*Heliotherapy and Surgical Tuberculosis, A. Rollier, Brit. J. Actinotherapy, March, 1927, i, 18.—(H. S. W.)*

Ultraviolet Rays.—Because of the multiplicity of the disorders for which it is recommended, light treatment is looked upon with disfavor in certain quarters. As definite effects upon the skin can be demonstrated in dermatological cases little opposition is encountered. But when the same form of therapy is said to be useful in all forms of tuberculosis, rickets, and various other diseases, the remedy is looked upon with considerable doubt. If an agent can be found capable of activating at least in some degree all the defense mechanisms of the body, then the list of diseases in which it is of value will be large. Ultraviolet ray approaches such an agent. All radiation is due to the vibration of electrons, and it travels in the form of waves through the ether. The sole difference between one form of radiation and another lies in their respective frequencies. The frequency of visible light is interpreted in form of color; in the case of invisible light (ultraviolet rays and X-rays) the skin shows itself capable of distinguishing between different frequencies and wave-lengths by its reaction. In local treatment of skin diseases, the production of an erythema is essential. Acne, dry eczema, alopecia, impetigo, pruritus, boils and scleroderma are some of the conditions which yield to local applications. These results are due probably to local phagocytosis induced by the erythema. In deep-lying conditions cure is brought about by counterirritation. It has been shown that ultraviolet rays can reactivate in codliver oil the antirachitic powers destroyed by heat. Leonard Hill and his coworkers have proved that an erythema dose over one-quarter of the body surfaces raises the bactericidal power of the blood. Here is a possible explanation, in bacteriological terms, of the action of ultraviolet rays in tuberculosis. It is often said that light treatment is useless and even dangerous in phthisis, but by cautious dosage (erythema should be avoided) and a careful selection of cases much good may be done. The patients must not be very ill, nor must they be of the well-known type which offers little resistance to the spread of the disease. The case that would struggle on for some years, doing a certain amount of work, is the one that will derive benefit. His working life will be prolonged, and his outlook on life altered for the better. If it is borne in mind that for the most part light acts as a stimulus to natural powers of defense, its limitations will be understood.—*Ultraviolet Rays: Their Place in Medicine, F. Hernaman-Johnson, Brit. Med. J., March 26, 1927, no. 3455, 562.—(U. E. Z.)*

Sources of Ultraviolet Light for Heliotherapy.—With the greater usage of heliotherapy in medicine purely empirical formulae are no longer adequate. In this paper is described the essential features of only a few of the typical modern sources of ultraviolet light, with particular reference to this part of their radiation; more particularly to set forth the physical laws, according to which such sources function and following which they may be developed and their radiations be prescribed and administered. In a list of sources of ultraviolet light useful to man the sun itself ought to stand first. The sun's light, as we receive it, is usually a very meagre source of ultraviolet radiation. The sunlight that gets through our atmosphere has at best a short wave-length limit at about 2,850 Å; and generally further attenuation by the atmosphere makes this lower limit range as high as 3,200 Å even in fairly clear weather. A substitute for sunlight is the mercury-vapor lamp in quartz. The spectrum of the mercury lamp is not continuous. It does not in any respect resemble sunlight. Of the total radiation from this lamp in normal operation some 15 to 20 per cent lies beneath 3,000 Å wave-length; that is, shorter than any sunlight we get in low altitudes. An important condition necessary to the reliable stipulation of the characteristics of a mercury lamp is that it shall have been lit long enough to reach a steady state (Pohle says nearly thirty minutes). A quite different type of source of ultraviolet light as a substitute for sun is the open or closed arc between carbon

or metallic poles. Some 80 per cent of the visible radiation of the arc comes from the hot crater of the positive pole. Incandescent-filament lamps are discussed in order to dismiss these sources from the category of ultraviolet radiators. In conclusion, the sources of ultraviolet radiation for therapy may be thought of as the mercury lamp, with its very intense short wave-length radiation and little else; the heavy current arcs, which with great energy outlay furnish a modicum of ultraviolet light along with much radiation of visual and longer wave-lengths; and arcs with special poles, which furnish a moderately intense controllable ultraviolet spectrum with a tolerable amount of other radiations. Incandescent filaments are not of moment. The physical laws are described according to which these sources function, so to enable one to judge how much or little the characteristics of the sources may vary with their mode of operation, and something of what may be accomplished by modification of working conditions of the lamps. The optical laws which define the illumination of objects by these sources are pointed out and the limits of their application are indicated. Certain points are noted at which a bridge from radiant energy to biological or physiological reaction must be constructed of firm fact of laboratory and clinical observation.—*The Physical Characteristics of Sources of Ultraviolet Light for Heliotherapy, M. Peterson, Am. J. Roentgenol. & Radium Ther., January, 1927, xvii, 19.*—(*W. I. W.*)

Transmissibility of Ultraviolet Radiations of Sun.—With the intention of reporting later on the relations between seasonal variations in ultraviolet radiation from the sun and seasonal incidences of morbidity and mortality, daily photographic records were made of the solar spectrum in Chicago between November, 1926, and May, 1927. Inspection of the plates revealed that the solar radiation in the winter months was extremely poor in the spectrum region 3,200 to 2,900 Ängstrom units, in May the last detectable lines being in the region 2,990. In March, when Chicago's atmosphere is heavily laden with smoke, the solar spectrum usually did not show any appreciable light intensity below 3,100 Ängstrom units, proving that ultraviolet rays are absorbed to a significant degree by smoke. Because it was thus shown that little ultraviolet radiation of known physiological importance appeared in the spectrum in the winter months, artificial sources of radiation were studied, photographs being taken of the spectrum of radiations from 300 Watt gas-filled Mazda lamps with ordinary glass and with "vitaglass" bulbs. The lamp with the ordinary glass bulb emitted ultraviolet radiation comparable to sunlight in the winter months. The vitaglass lamp was far richer in transmitted radiation. In another experiment it was found that vitaglass transmitted the ultraviolet rays of sunlight nearly as well as quartz, while a comparison of solar spectra through quartz, clear vitaglass, laboratory window-glass and a piece of thin window-glass plainly demonstrated the advantages of vitaglass over ordinary glass.—*Ultraviolet Radiation from Sunlight and Incandescent Lamps. Its Transmission Through Window Glass and Substitutes, H. N. Bundesen, H. B. Lemon, I. S. Falk and E. N. Coade, J. Am. M. Ass., July 16, 1927, lxxxix, 187.*—(*G. L. L.*)

Bactericidal Action of Light.—As a review of the literature indicated that the tubercle bacillus can be destroyed by ultraviolet rays, but failed to demonstrate the selective region, further investigations were carried out. In one group of experiments tubercle bacilli were exposed to a mercury-vapor lamp with rays of varying wave-length. In another group of experiments tubercle bacilli were mixed with blood or serum, and exposed in a very thin film to the ultraviolet rays. Control experiments, in which guinea pigs were inoculated with tubercle bacilli in different fluids, were done. *Conclusions:* The tubercle bacilli suspended in saline solution are destroyed after 10 minutes' exposure to the radiations (7,620–2,300 Ängstrom units) of the mercury-vapor lamp. Tubercle bacilli mixed with blood or serum, exposed in a very thin film, are not killed. Similar experiments carried out with mixtures of defibrinated rabbit blood and staphylococci have shown that bactericidal action is noticeable after half an hour's irradiation of the thin blood film, and complete destruction of the cocci after one hour's exposure. These experiments afford evidence that rays shorter than 3,300 Ängstrom units are the most bactericidal for the tubercle bacillus. The long ultraviolet rays, from 4,000 to 3,300 Ängstrom units, are without effect. Since the penetration of the shorter ray is small, it is doubtful whether a local bactericidal action occurs *in vivo* with either the local Finsen lamp or the Kromayer type of lamp for local treatment. The fact that the whole range of rays from 5,760 to 2,300 emitted from the mercury-vapor lamp cannot destroy tubercle bacilli in a thin blood film, even after an hour's exposure, strongly supports this view. The cure of lupus

vulgaris by means of local irradiation must be due chiefly to tissue reaction.—*The Bactericidal Action of Light on Tubercle Bacilli, A. Eidinow, Brit. Med. J., July 30, 1927, no. 3473, 160.*—(*W. I. W.*)

Filtration of Ultraviolet Rays.—Spectrographic study of the radiation of a mercury-vapor lamp with a quartz tube showed a great difference between direct radiation and that filtered through glass. The former registers on films up to a wave-length of 2,225 Ängstrom units. The interposition of a layer of air of 3 metres between the burner and film does not prevent the passage of wave-lengths up to 2,300 Ä. But if the light is filtered through glass it is cut to 2,968 Ä. for a thickness of 1.2 mm., to 3,130 Ä. for one of 2.2 mm., and to 3,341 Ä. for one of 7.3 mm. Thus the rays filtered through glass are deprived of those parts which are caustic and irritating to the skin and mucosa. Nogier also presented new electrodes devised by Gallois for high-frequency currents. These are enclosed in quartz, and contain a quantity of mercury and a conducting thread. The vacuum is made up of argon. The spectrograph shows an abundance of ultraviolet rays, up to 2,377 Ä. The ray, 2,536 Ä, is especially intense. These new electrodes permit application to the body cavities, such as the rectum, vagina, ureter, and fistulous tracts. —*Les rayons ultra-violets filtrès par l'air sont-ils identiques aux rayons ultra-violets filtrès par le verre. Also: Nouvelles electrodes en quartz pour les courants de haute fréquence produisant des rayons ultra-violets, Nogier, Meeting, Soc. Nationale de Médecine et des Sciences Médicales de Lyon, January 26, 1926, reported in Presse Méd., January 30, 1926, no. 9, 138.*—(*A. P.*)

Treatment of Ocular Disease with Ultraviolet Light.—There are several diseases of the eye which develop rather as manifestations of underlying constitutional disease associated with malnutrition (tuberculosis, rickets, etc.) than as primary ophthalmological disease. Such diseases as acute or chronic blepharitis, conjunctivitis, phlyctenular keratoconjunctivitis, keratitis, corneal ulceration and iritis come in this group, and occur chiefly in children and young adults. The more chronic types appear to respond more readily to general and ultraviolet therapy. Patients are stripped except for short drawers, are placed in a recumbent posture and the eyes protected by adequate goggles. Radiation is then applied to the body and not to the eyes. The distance from the lamp to the body is two feet, and the first exposure two minutes to the front and two minutes to the back of the thorax. Exposures are made three times a week and are gradually increased to fifteen-minute periods, front and back, a mild erythema being the best guide as to the length of exposure. Over exposure induces nausea and vomiting. There is often an initial fall in weight after treatment is instituted, followed by a steady rise, and in the absence of the latter the treatment should be discontinued. In several cases phlytenules disappeared after four treatments. Local treatment with eye-washes, etc., must be carried on just as if no radiations were being given. Scars can frequently be prevented but, when present, they obviously require other treatment than radiation.—*Ultraviolet Radiation in the Treatment of Certain Eye Cases, I. Spiro, Brit. J. Actinotherapy, July, 1927, ii, 63.* —(*H. S. W.*)

Antirachitic Activity of Ultraviolet Rays.—Two bands of ultraviolet radiation, one containing rays shorter than 290 millimicra (the shortest of the sun's rays being 290 millimicra) and the other those between 290 and 313 millimicra, were compared for their effect in protecting rats from rickets. The shorter rays were found more potent in healing rickets than the second group, representing the effective area of solar rays. The upper limit of antirachitic activity is in the neighborhood of 313 millimicra. Moisture, smoke or dust in the atmosphere may absorb rays shorter than 300 or 310 millimicra, and the shorter radiations are not available during part of the winter, so that unfavorable conditions markedly limit the range of effective radiations. By irradiating cholesterol by isolated individual wave-lengths of ultraviolet radiations it was found that those of 280 and 302 millimicra were markedly antirachitic, while activity at 313 millimicra is very feeble.—*The Antirachitic Activity of Monochromatic and Regional Ultraviolet Radiations, A. F. Hess and W. T. Anderson, J. Am. M. Ass., October 8, 1927, lxxxix, 1222.*—(*G. L. L.*)

Treatment of Haemoptysis by Irradiation of Spleen.—In 6 cases of pulmonary tuberculosis in which the ordinary haemostatic remedies were without avail, X-ray treatment of the spleen resulted satisfactorily. The technique was to ray the spleen at a focus distance of 23 cm., filtering through 4 mm. of aluminum or 0.5 mm. of zinc plus 3 mm. of aluminum, with a dose of about 40 per cent of the erythema dose. The action of the X-ray upon the spleen is believed to be due to a stimulation of the

normal function of this organ with a resulting increased thrombolysis and excess of substances that hasten coagulation being poured into the blood.—*Uber Röntgenbestrahlung der Milz, insbesondere deren Wirkung bei Lungenblutungen, A. Neddermeyer, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 555.—(H. J. C.)*

Experimental X-Ray Treatment of Tuberculosis.—From the literature on the subject one gathers that the effect of roentgen-rays upon the "defense reaction" of the body is extremely complex and is as yet not well understood. There have not been taken into account such matters as (1) the susceptibility of the various animal species to the disease, (2) the necessity, under experimental conditions, of radiating the animal's entire body (in small animals), and (3) the computation of dosage. This has produced a confused state because of the widely diverse results which have been reported. The question has therefore been studied again. With a Kelley-Koett roentgen-ray apparatus, having an autotransformer and a Coolidge universal tube of broad focus, three voltages were used "to cover a range of dosage which is in current therapeutic use in tuberculous peritonitis or adenitis." Guinea pigs, placed in pasteboard boxes having irregular holes in the lids, were given weekly treatments for eight to ten weeks. A one-minute exposure with a 5-ma. current and 9-inch skin focal distance was used. This the animals tolerated well, although their mortality rate was high during the first week following the first exposure. No loss of weight occurred. However, when the dosage of X-rays was too great, the animals lost weight, and developed conjunctivitis and blepharitis, and many died. In a test group of 7 guinea pigs, an average of 8.9 consecutive weekly treatments was given, the animals maintaining fair health; and the haemoglobin appeared unaffected, although there developed a leucopenia in which the lymphocytes were found to be present in normal proportion. After these preliminaries 52 guinea pigs were inoculated intraperitoneally with a suspension of virulent tubercle bacilli. One-half of these were used as controls, and groups of the other half were treated daily with varying exposures to X-rays, beginning at 2-minute and ending with 20-minute periods. The early death-rate among the irradiated animals was slightly higher, but in the two lots this was about equal after the third week. At autopsy it was impossible to distinguish between the amount of tuberculosis in the control and the treated animals. The group treated with larger doses of X-rays, however, lived on the average a somewhat shorter time than the controls.—*The Effect of Roentgen Rays on the Development of Tuberculosis in Guinea Pigs, F. A. Ford, Radiology, September, 1927, ix, 235.—(H. S. W.)*

X-Ray Treatment of Pulmonary Tuberculosis.—As the result of roentgen-therapy in 5 severe cases of pulmonary and bronchial lymph-node tuberculosis with favorable results, the method is given a hearty recommendation and the details of technique are presented. It is believed that a change from the exudative to the productive form of disease was attained. In one case there resulted numerous large cavitations under treatment, which are viewed as bronchiectases resulting from the traction of the contracting lung tissue. In the bronchial node tuberculosis a beneficial effect upon the irritating cough and the general well-being was especially noted.—*Beitrag zur Röntgenbehandlung der Lungentuberkulose, M. D. Koolman and M. Kretschmer, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 684.—(H. J. C.)*

Intracardiac Injections in Treatment of Pulmonary Disease.—*A priori*, puncture of the right heart is the surest means of access to the lung. Intracardiac injections of adrenalin in anaesthetic syncope and punctures of the heart for withdrawing blood have demonstrated the innocuousness of aseptic perforation of the myocardium. This procedure was successfully carried out on normal dogs. A dog suffering from bronchopneumonia was given several intracardiac injections of gold salts and methylene blue for therapeutic purposes. Following the injection, the temperature dropped and the animal recovered. Puncture of the right heart may offer a favorable therapeutic measure in the treatment of pulmonary tuberculosis.—*Les injections intracardiaques droites dans le traitement des affections pulmonaires, Cherechewski, Florentin and Lebouyries, Meeting, Acad. Méd., April 19, 1927, reported in Prog. Méd., May 7, 1927, no. 19, 715.—(U. E. Z.)*

Rationale of Chemotherapy of Tuberculosis.—In the gold treatment of tuberculosis this metal reaches the foci of disease in unchanged form, and is more avidly taken up by the diseased cells and decomposed by them than by the healthy cells, and this causes a directly curative action upon the cells. Similar to surgical treatment, there are elicited mechanical changes in the diseased focus, which occasion the healing. If this focal reaction is viewed as a hyperae-

mia, set up by vasamotor changes in the hypersensitive body, with increased irritability of the specifically sensitized vegetative nervous system, then the healing action of gold, tuberculin and surgical measures is explained in identical fashion. The basis of all these healing procedures is then secondarily the result of general changes.—*Chemotherapie und andere Behandlung der Lungentuberkulose, E. Guth, Ztschr. f. Tuberk., 1926, xlv, 206.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with Gold.—*Krysolgan, Triphal* and *Sanocrysin* all exerted about the same influence, a greater disappearance of tubercle bacilli being more frequently seen with *Sanocrysin* than with *Krysolgan* and *Triphal*.—*Zur Chemotherapie der Lungentuberkulose, E. Guth, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 444.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with "Aurophos."—The author reports his therapeutic experiences with the gold preparation *Aurophos*, which is a double salt of sodium and gold combined with an amino-arylphosphinic acid and sulphurous acid. Eighty cases of predominantly productive-cirrhotic or of cirrhotic type were treated by initial biweekly injections of 0.001 gm., increasing 50 per cent until a dose of 0.1 gm. had been reached, and in exceptional cases being carried up to 0.5 gm. Aside from headaches, lassitude, palpitation and slight fever, no other symptoms resulted. The clinical results were relatively good in that there was a diminution of sputum, a disappearance of bacilli, an improvement of the sedimentation rate, as well as a more or less definite improvement of the pulmonary findings. In 14 cases of noncirrhotic tuberculosis of the third stage the results were less favorable.—*Klinische Erfahrungen mit Aurophos, F. Oldenburg, Ztschr. f. Tuberk., 1926, xlvi, 467.*—(*H. J. C.*)

Mode of Action of Krysolgan.—It is believed that the bactericidal action of *Krysolgan* is the predominating one, and that it can only act when bacilli circulate in the blood, since it is only these bacilli that are affected. As the result of this, tuberculin-like substances are liberated, which occasion the focal reaction. With proper dosage and satisfactory intervals a certain accumulation occurs, which may result in an active saturation of the tuberculous focus with the gold salt.—*Wie wirkt Krysolgan? C. Stuhl, Ztschr. f. Tuberk., 1926, xlv, 208.*—(*H. J. C.*)

Treatment of Surgical Tuberculosis with "Krysolgan" and "Triphal."—*Krysolgan* and *Triphal* were used in 12 cases of bone and joint tuberculosis. These reagents were given partly intravenously and partly by local injection in novocain solution. The results in 50 per cent of the cases were good, there occurring an increase in weight, diminution of the secretion from the fistulae and rapid closure. The beneficial effects on mixed infection were striking. Only small doses were used, in adults from 0.0005–0.05 gm., and in children 0.0001–0.01 gm. On account of the slow excretion of the gold salts there exists the danger of a cumulative effect.—*Die Goldbehandlung der chirurgischen Tuberkulose, H. Achelis, Arch. f. klin. Chir., 1926, cxliii, 582.*—(*H. J. C.*)

"Triphal" in Pulmonary Tuberculosis.—*Triphal*, an organic gold compound, was tried on 21 patients with pulmonary tuberculosis. The injections were given at weekly intervals, the initial doses being 0.001 gm. The maximum dose which patients were able to tolerate was 0.4 gm. The maximum total amount given was 2.356 gm. As a rule the injections were tolerated well. The patients complained occasionally of headache and nausea after the injections. No other untoward results, particularly no renal disturbances, were observed. In one case a universal exanthema occurred. Only 4 patients showed marked improvement after the treatment. This improvement was definitely more than what could be expected from the usual sanatorium treatment. Six cases improved slightly, and it was doubtful whether the improvement could be attributed to the action of the gold preparation. In the remaining 11 patients no noticeable improvement occurred. Whatever action *Triphal* may have must be explained as a stimulating effect and not as a chemotherapeutic action.—*Erfahrungen mit Triphal bei Lungentuberkulose, A. Fischer, Wien. klin. Wchnschr., May 5, 1927, xi, 591.*—(*M. P.*)

Dermatitis Due to "Triphal."—In 4 patients who were treated with *triphal* for lupus erythematodes extensive dermatitis developed which in some of the cases lasted for several months. Since this occurred only in a small percentage of the treated patients and since there was no relation between the dosage of the drug and the appearance of the cutaneous eruptions, the author believes that the phenomenon is due to specific hypersensitiveness. In spite of the disagreeable ill effects in some cases, the author recommends *Triphal* highly for the treatment of lupus erythematodes since he claims better results with it than with any other treatment.—*Triphaldermatitis, D. Oláh,*

Wien. klin. Wchnschr., June 9, 1927, xl, 749.—(M. P.)

Sanocrysin.—On the foundation of repeatedly published clinical observations and of the successful experimental therapeutic work by Madsen and Moerch (recently repeated with completely negative results by Bang), the question of dosage is again discussed. The original opinion, that Sanocrysin can bring about a sterilization, is maintained. Large doses, about 0.015 per kilo bodyweight, are necessary and can usually be tolerated. Shock and albuminuria can be prevented by the judicious use of Moellgaard's serum. The clinical use of Sanocrysin has become safer not by reducing the dosage, but by selecting the suitable patients more intelligently, and excluding those who are too far advanced, too fibrotic, or too cachectic. The poor results which have been published so frequently are due either to too small dosage, the failure to use the serum, or to unsuitable selection of patients.—*Sanocrysinfragen, K. Secher, Klin. Wchnschr., June 11, 1927, vi, 1139.—(M. P.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—The clinical work on Sanocrysin in France and Denmark is briefly reviewed. From personal experience the authors formulate the following contraindications: (1) the existence of renal or hepatic lesions; (2) old fibrotic tuberculous lesions; in this type of case the treatment is useless; (3) miliary tuberculosis; (4) emaciated patients; and (5) unilateral cases in which pneumothorax is indicated and operable. *Indications:* (1) bilateral ulcerative casesous lesions; (2) unilateral ulcerative caseous lesions with adherent pleura and (3) tuberculous bronchiectasis. *Dosage:* The injections are given at first intramuscularly. The initial dose is 0.1 gm. Injections are given every two days, successive doses increasing by 0.1 gm. until, at the fifth injection, a dose of 0.5 gm. is reached. From then on the injections are given intravenously at weekly intervals, increasing the amount of the drug each time by 0.1 gm. until 1.0 gm. is attained. This amount is not exceeded, and the injections are continued, barring accidents, for an indefinite period. It is claimed that the preliminary intramuscular injections increase the mononuclear leucocytes, and thus raise the patients' resistance against the Sanocrysin toxicity. Fifteen patients were treated and followed over a period of two years. *Results:* In two patients improvement was rapid and excellent and apparently was due to the drug. In one patient an excellent result was obtained, but there was a relapse with extension of the disease one year after cessation of Sanocrysin treatment. Two patients were favorably influenced by the medication. *Conclusions:* From their own observations and from a review of the literature on the subject the authors express the view that Sanocrysin is an unreliable therapeutic measure in tuberculosis. There are numerous contraindications to its use, and its indications are limited and still provisional. There is evidence that in certain cases it has a beneficial action. Great importance is placed on the mode of administration. Small amounts of the drug given intramuscularly should precede the intravenous injections. An injection must not be given until all reactions from the preceding dose have entirely cleared up. With these precautions as to technique and a very prudent selection of indications, the complications attributable to the treatment are very much reduced and the favorable results are no longer counterbalanced by the apprehension of grave accidents. The action of the gold salts is interesting in principle, but a very delicate measure and of inconstant therapeutic value.—*Étude critique sur le traitement de la tuberculose pulmonaire par la sanocrysine, M. Villaret, L. Justin-Besançon and Imbert, Prog. Méd., February 5, 1927, no. 6, 193.—(B. T. McM.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—This drug was used in the treatment of 18 cases of pulmonary tuberculosis. In 12 cases the disease was of one year or less duration. In 6 the lesions were much older. An initial dose of 0.05 gm. was given and the maximum dose was 0.5 gm. The injections were administered intravenously at weekly intervals. *Conclusions: 1:* The use of Sanocrysin and similar products is indicated in cases of pulmonary tuberculosis especially of the exudative type, provided the duration of the disease is less than one year, provided there is no high fever or signs of severe toxaemia, and provided the treatment is carried out in a hospital or sanatorium in conjunction with general rest. *2:* Small doses are sufficient (2 to 5 gm.) to obtain diminution of cough, disappearance of bacilli, cessation of fever and the attenuation of auscultatory and radiological signs. *3:* The effects of such chemotherapy are not always of long duration but permit of marked attenuation of the disease and recovery of organic resistance. *4:* The action of Sanocrysin and allied products is not directed against the bacillus and on the disease in an etiotropic sense, but they facilitate the expulsion of the already dead tuberculous

tissue.—*L'aurotiosolfato di soda nella cura della tubercolosi polmonare, F. Alessio and M. Penada, Tubercolosi, August, 1927, xix, 287.—(U. E. Z.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—Improvement was noticed in 17 of 34 open and predominantly active cavernous cases of phthisis treated with large doses of Sanocrysin. Of the 17, nine became free from bacilli. It is believed, however, that the same improvement in the pulmonary findings can be obtained by simple sanatorium treatment.—*Erfahrungen mit Sanocrysin bei Lungentuberkulose, H. Poindecker, Ztschr. f. Tuberk., 1926, xlv, 484.—(H. J. C.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—Exhaustive tests were made on 16 patients treated with Sanocrysin and observed for over a year. Four of the cases were uninfluenced or unfavorably influenced, 6 were improved and 6 were markedly improved. The further use and testing of sanocrysin are recommended.—*Über die Sanocrysinbehandlung der Lungentuberkulose, W. Zinn, Ztschr. f. Tuberk., 1926, xliv, 353.—(H. J. C.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—Twenty cases were treated with sanocrysin, 18 of them being open cases of the third stage, and 6 of them having coincident pneumothorax. There was a favorable influence in 20 per cent, 10 per cent died and 10 per cent became worse. Sanocrysin, carefully administered, can be beneficial in individual cases. The treatment is, however, only suitable for sanatorium use.—*Klinischer Beitrag zur Sanocrysinbehandlung der Lungentuberkulose, H. Jessen, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 46.—(H. J. C.)*

Nature of Symptoms Following Sanocrysin.—The reaction symptoms following sanocrysin, differentiated into (1) general nervous symptoms, (2) pyrexia, (3) albuminuria, (4) skin and mucous-membrane inflammation, (5) gastric and intestinal symptoms, (6) changes in the blood picture, and (7) focal reaction, are due to a gold intoxication.—*Wie sind die Reaktionserscheinungen nach Sanocrysin aufzufassen? A. Beekmann, Beitr. z. Klin. d. Tuberk., 1926, lxv, 130.—(H. J. C.)*

Treatment of Pulmonary Tuberculosis with Sanocrysin.—Twenty-four cases were treated, of which number fifteen were moderately advanced and nine advanced. The treatment resulted in 37 per cent quiescent, 37 per cent improved, 9 per cent not improved, 13 per cent worse and 4 per cent died. It is pointed out that this is better than the usual sanatorium result in similar cases.—*A Note on the After Results of Sanocrysin Treatment, B. R. Clarke, Tubercle, July, 1927, viii, 10.—(B. H. D.)*

Conclusions of Austrian Sanocrysin Committee.—The dangers of Sanocrysin treatment can as a rule be excluded by careful dosage and observation. The Moellgaard serum is superfluous and not without danger. Contraindications for Sanocrysin treatment are intestinal symptoms and kidney disease. The same results can be attained with Sanocrysin treatment as with other methods of treatment.—*Schlusssitzung des österreichischen Sanocrysin-Komitees, Poindecker, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 772.—(H. J. C.)*

Therapeutic Effects of Sanocrysin and Partigens Compared.—As a result of an experience in 15 cases treated with Sanocrysin which had previously received *M TbR* treatment, and, in addition, 500 *M TbR* treatments, the partigen treatment is considered preferable, in that it can be used in all forms of tuberculosis, and it is inexpensive and without danger. By comparison Sanocrysin has uncertain indications, the dosage is difficult, there are unavoidable concomitant toxic effects, and it is more expensive. Sanocrysin should be used only when the partigens have increased the resistance and when further cautious reactions are desired. In tuberculosis it is a law that an increase and improvement of the immunity should be attained and the best measure still lies in the use of partigens.—*Über die Sanocrysinbehandlung der Lungentuberckulose im Vergleich zur Partigentherapie, H. Jannasch, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 114.—(H. J. C.)*

Sanocrysin and Experimental Tuberculosis.—Moellgaard's results in tuberculosis are, in all probability not at all related to Sanocrysin treatment, but rather to the varying resistance of calves toward the abnormally weakly virulent tubercle bacilli. Since Moellgaard's tuberculosis serum was found entirely inactive in tuberculin-shock experiments, his serum therapy is considered a fantastical, and the shock a metallic intoxication. Sanocrysin cannot in any way be considered a chemotherapeutic agent in the Ehrlich sense.—*Sanocrysin und experimentelle Tuberkulose. Kritik und Antikritik, O. Bang, Ztschr. f. Tuberk., 1926, xlv, 122.—(H. J. C.)*

Criticism of Bang's Experiments with Sanocrysin.—Moellgaard criticises Bang's repetition of his experiments with Sanocrysin. He reproaches him for improper dosage in calves and an improper use of the serum, and for not allowing the Sanocrysin reaction to disappear. The activity of the serum is indicated by the work of Madsen, while Sweany's culture experiments are referred to as indicating Sanocrysin's bactericidal action.—*Einige Bemerkungen über die Bangschen Versuche mit Sanocrysin, H. Moellgaard, Ztschr. f. Tuberk., 1926, xlv, 120.—(H. J. C.)*

Treatment of Pulmonary Tuberculosis with Sulphates of Ceric Earths.—Fifteen patients, all of whom had positive sputum, were treated with *Geodyl*. The treatment consisted of intravenous injections of a solution of the mixed preparation of ceric earths, known as *Geodyl*. The injections were given daily for twelve days. A careful observation of this group of patients did not reveal any lasting benefit to any of them, though it is pointed out that no harm was done. Five patients were treated with sodium chaulmoograte and gynocardic acid. No beneficial result was recorded in this group. *Proflavine* being a powerful antiseptic which can be used intravenously in proper dilution, it was decided to treat 12 cases with this preparation in the hope of producing a bactericidal effect. These patients were all hopeless cases and all of them died. One, however, lived ten months, which was a much longer time than he probably would otherwise have survived. An antipyretic effect was noted in 8 cases. The conclusion is reached that the dyes of the flavine group are of no benefit in tuberculosis.—*The Treatment of Chronic Tuberculosis with Sulphates of the Ceric Earths, Chaulmoogra Oil and Proflavine, C. Milne, Tubercle, May, 1927, viii, 360.—(B. H. D.)*

Treatment of Haemoptysis with Tartrate of Antimony.—In 11 febrile cases of advanced pulmonary tuberculosis, with persistent haemoptysis which had failed to yield to the usual drugs, particularly emetine, antimonium tartrate was administered daily by mouth in doses of 0.05 to 0.15 gm. for an average of five days. Prior to this treatment there was no indication of the spontaneous termination of haemoptysis in any of these cases. In 5 cases haemoptysis ceased in five minutes after an initial dose of antimonium tartrate of 0.05 gm., while in the other 6 cases doses of 0.03 gm. rapidly reduced the amount of bloody sputum. In 8 cases arrest of haemorrhage quickly followed the appearance of nausea, but in 3 cases bleeding ceased abruptly before the onset of this symptom. The drug was given in 10 or 15 cc. of water with 0.01 gm. of thebaic extract, and during the period of haemoptysis and for twenty-four hours after blood-spitting had ceased the patients were kept on a diet of cold milk. In doses of 0.05 to 0.15 gm. a day, and totalling 0.89 gm. for a ten-day course, there was no evidence of toxicity except nausea and increased salivation. Frequent observations of blood-pressure during the course of treatment revealed very little alteration, except slight transient diminution in several cases. The pulse-rate was slowed only from 2 to 8 beats a minute, and the fever remained unaffected. It is desirable to keep the total dosage for a course under 1 gm. and to discontinue treatment five or six days before further administration of the drug. The action of the drug does not appear to be due to a lowering of the blood-pressure in the general circulation, but to the establishment in the pulmonary circulation of a condition favoring haemostasis. There is presumably a vasomotor reflex action of gastric origin on the vessels of the lung, a depressing action on the right ventricle, and a direct action on the pulmonary vasomotor fibres and on the smooth muscle of the vessels of the lung. The innocuousness of antimonium tartrate and its definite and regular action as demonstrated in these 11 cases recommend it as the drug of choice in the treatment of haemoptysis.—*L'emploi du tartre stibié par voie buccale contre les hémoptysies tuberculeuses, C. Maitei and F. Escudier, Presse Méd., October 14, 1925, no. 82, 1361.—(E. H. K.)*

"Ipecopan" as Expectorant in Pulmonary Tuberculosis.—*Ipecopan*, containing the active constituent of Emetin and the total alkaloids of opium, was tested on 50 cases in the sanatorium. In acute and subacute bronchitis, as well as in cases of pulmonary tuberculosis, the irritating cough is ameliorated and expectoration made easier.—*Ipecopan als Expektorans, H. Knüppel, Ztschr. f. Tuberk., 1926, xlvi, 424.—(H. J. C.)*

Treatment of Tuberculosis with Colloidal Antimony.—Collosol antimony (Crookes) is administered in 0.5-cc. doses intramuscularly twice a week. This form of the drug is not attended by shock. On the day following the treatment the patient feels a little tired, but when this fatigue has passed off there is a distinct improvement, the appetite increases, the breathing becomes easier, and the patient feels brighter and more alert. The effects on the lesion seem to resemble those produced by Sanocrysin,

but are without its dangers. Much more work with this treatment is clearly necessary before it is possible to say whether the results are better than those produced by other methods. The author's observations are encouraging, and it is with the hope that others will try this form of therapy that this preliminary note is made.—*Treatment of Tuberculosis. A Note on the Effect of Colloidal Antimony, P. Moxey, Brit. M. J., February 26, 1927, no. 3451, 374 (B. T. McM.)*

Treatment of Pulmonary Tuberculosis with Iodine.—Since the physiological action of iodine and iodides is quite different, these two drugs must not be confused in phthisiotherapy. Potassium iodide is eliminated rapidly, while iodine tends to accumulate in the thyroid, lymph nodes and liver, and is eliminated slowly, in part through the lungs. Iodides have a great osmotic power and consequent lymphagogue action, while iodine is fixed in the tissues and undergoes slow transformation. While iodides may cause congestive phenomena, similar dangerous action cannot be attributed to iodine. In tuberculosis iodine exercises an inhibitory power, if not on the actual bacilli, at least on their toxins. It also brings about a hyperleucocytosis with stimulation of phagocytic activity, raises the opsonic index, stimulates the glands of internal secretion, and increases the respiratory quotient. Cases suitable for iodine therapy are those of a chronic fibrotic type with not more than one lobe infiltrated. Such cases have good resistance and are without severe general symptoms or very abundant expectoration. While iodine apparently does not cause haemoptysis in this type of case, it is contraindicated in acute and rapidly progressive forms of the disease, in which there is a tendency to repeated and severe haemoptysis. The drug should be administered only to those who are under close supervision and who are taking the routine cure. Beneficial effects of iodine therapy are claimed to be diminution of toxic phenomena, disappearance of râles, improvement in the general condition, marked tendency to fibrosis, and in some cases disappearance of bacilli from the sputum. An organic preparation of iodine is recommended, and 5 or 6 series of 30 daily injections are given with two weeks interval between courses.—*Indications et résultats de la medication iodée dans le traitement de la tuberculose pulmonaire chronique, M. Nigoul-Foussal, Presse Méd., November 7, 1925, no. 89, 1478.—(E. H. K.)*

Treatment of Pulmonary Tuberculosis with Calcium.—Calcium salts exert a tonic effect upon the sympathetic nervous system. Calcium reinforces cardiac action and increases the blood pressure. It exercises a remineralizing action upon the entire body. It modifies some of the conditions of immunity and prevents anaphylactic reactions. Calcium has a decongestive effect upon the body organs, and the bronchial secretions are diminished. The blood calcium is lessened in various disease conditions, especially tuberculosis. On this basis many phthisiologists use various forms of calcium as a therapeutic measure of the first importance in this disease. It has been given orally, intramuscularly and by inhalation with far from satisfactory results. The intravenous route is the best, but many observers have found that although the calcium salts enter the circulation directly only small amounts are fixed and utilized by the body. In spite of this method a rapid elimination of calcium in the urine and feces has been noted. To determine whether vitamine B has any power to fix calcium salts, 6 patients were given intravenous injections of a 10 per cent solution of calcium chloride alone, and 6 others received a 5 to 7 per cent solution of vitamine B in addition to the calcium chloride. A study of the 24-hour specimens of urine from each patient was made to determine an increased or decreased elimination of calcium. In 8 patients a marked improvement in general condition was noted following calcium therapy. Cough was diminished in 4 cases. The amount of expectoration was reduced in 5 patients. Night-sweats were checked in all patients having them. A drop in temperature was observed in 4 cases, and 2 patients suffered marked febrile reactions following the injections. Haemoptysis remained uninfluenced by the treatment. No effects on the blood-pressure were observed. There was a marked fall in the urinary calcium elimination in 7 patients, and 5 of these received the vitamine B in addition to the calcium chloride. An increased elimination of calcium in the urine was observed in 5 cases, 3 of which received calcium chloride alone. There was a direct relationship between advanced disease with febrile reactions and increased excretion of the salt. *Conclusions: 1:* Intravenous calcium therapy is useful in cases of advanced tuberculosis only to alleviate some of the symptoms (sweats, expectoration, anorexia, etc.). *2:* It is useless in patients showing an increased calciuria during treatment, because the organism is unable to cause a fixation of the calcium salts. *3:* Solutions of calcium salts given alone are excreted without any evident fixation. *4:* Greater fixation of calcium salts is obtained with solutions of calcium

and B. vitamine—*Sulla fissazione del calcio associato a vitamine nella tubercolosi polmonare, A. Fiorentini and A. Astorre, Tubercolosi, February, 1927, xix, 53.—(U. E. Z.)*

Treatment of Pulmonary Tuberculosis with "Helpin."—The chemical industry Grünau has introduced a nonspecific lipoid preparation, consisting of a mixture of ovolecithin, glycerine, and various sodium, potassium and calcium salts, which is called *Helpin*. This is tolerated parenterally in doses of 1.5 to 3.0 cc. without the slightest local, focal or general reaction. The advantage of this preparation appears to be in promoting increase of weight. In patients of satisfactory weight or powers of resistance *Helpin* proved inactive. A favorable influence was noticed upon the red-cell sedimentation reaction, the sputum and the microscopical appearance of the sputum. In certain cases there was an unquestionably favorable effect upon the physical pulmonary findings, which is viewed as being due to a nonspecific detoxicating action of the lipoid bodies.—*Über Lipoidtherapie bei Lungentuberkulose mit besonderer Berücksichtigung des Präparates "Helpin," W. Freymuth, Ztschr. f. Tuberk., 1926, xlv, 493.—(H. J. C.)*

"Helpin" in Experimental Tuberculosis.—*Helpin* is tolerated parenterally very well up to a dose of 5 cc., a relatively large amount. Preliminary treatment with Helpin does not protect against the mildest infection with tubercle bacilli given intracutaneously. It does, however, appear that the tuberculosis in animals treated previously and after infection is beneficially influenced.—*Die prophylaktische und therapeutische Wirkung von Helpin auf die experimentelle Meerschweinschentuberkulose, R. Freund and I. Magat, Ztschr f. Hyg., 1926, cvi, 720.—(H. J. C.)*

Camphor in Treatment of Pulmonary Tuberculosis.—Highly favorable results were had from the use of camphor in pulmonary tuberculosis. The treatment was given as a series of injections over a period of 20 days, 1.5 cc. of 20 per cent camphorated oil being administered daily. The treatment resulted in a regular reduction of fever, detoxication and general sedative effect in 430 cases studied. In the treatment of pulmonary haemorrhage camphor is considered indispensable. It is also believed to have prophylactic value. In haemorrhage the dose must be increased to 3 cc. of 20 per cent camphorated oil every six hours for two days.—*Die Rolle des Camphers in der Behandlung der Lungentuberkulose, F. I.. v. Muralt and P. Weiller, Ztschr. f. Tuberk., 1926, xlvi, 341.—(H. J. C.)*

Treatment of Pulmonary Tuberculosis with "Lipatren."—Nonspecific irritation therapy is recommended as a means of stimulating reactive cell-groups to an increased resistance. A most suitable medium for tuberculosis is *Lipatren*, which is *Yatren*, plus a solution of animal lipoids. In order to obtain a satisfactory focal reaction suitable dosage is necessary, beginning with 0.1 to 0.3 cc. *Lipatren* intramuscularly at weekly intervals; this is increased by 0.1 cc. until a dosage is reached which elicits a still determinable focal reaction by auscultation. Exact auscultatory control is essential, since all other methods are too crude. When the optimal dose is reached this is maintained for 1 to 2 months, after which a further increase to double or triple the threshhold irritation dose is aimed at. Overdosing is warned against. Equally as important as the proper medium is the indication. The primary stage of tuberculosis, according to Ranke, does not come into consideration, since, practically, it is out of the field of diagnosis. In the secondary stage of pulmonary tuberculosis the nonspecific irritation therapy is frequently harmful, and in every case uncertain, since it is impossible to determine whether the organism is unable or capable of reacting without injury. *Lipatren* treatment acts most favorably in the tertiary stage. High altitude may reinforce the nonspecific irritation therapy. General reactions occur only after severe focal reactions. Of 47 cases of open tertiary pulmonary tuberculosis there were 38 that became free from bacilli within 3 to 6 months, 6 showed definite improvement, 2 remained uninfluenced, and 1 died of a severe haemorrhage. Direct focal injury was never observed with proper dosage and indications for Lipatren therapy.—*Unspezifische Reiztherapie bei der Lungentuberkulose, G. Maurer, Beitr. z. Klin. d. Tuberk., 1926, lxiv, 433.—(H. J. C.)*

Treatment of Tuberculosis with "Lipatren."—*Lipatren* is prepared by adding *Yatren* to animal-lipoid. Its use in tuberculosis is based upon its "irritating" properties. It was given by mouth to 42 patients with pulmonary tuberculosis, in most of whom there occurred an initial incidence of cough and expectoration; in two haemoptysis and in three a rise of temperature followed the first doses. One case remained entirely refractory; in ten no subjective or objective improvement could be observed but the remainder, especially the productive cases, seemed to be helped. Of 18 patients with bacilli in the sputum, seven became "sputum-negative" after six to seven months of treatment.—*Zur Lipoidreiztherapy bei chronischer Lungentuber-*

kulose, M. Reicholt, Deutsche med. Wchnschr., March 18, 1927, liii, 483.—(H. S. W.)

Intrapleural Injections of Codliver Oil.—Empiricism determined the therapeutic use of codliver oil in tuberculosis, and recently a number of workers have studied it experimentally, not only in tuberculosis but in other acid-fast infections. In this particular study, as it was thought that the lipoids might exert an active therapeutic effect, the oil was prepared at less than 50°C., cooled four hours at 0°C., warmed to 55°C. for the same period, and finally filtered under pressure. It was strictly sterile. It was decided to administer it intrapleurally, as anatomical and pathological studies have shown the richness of the subpleural network and the ease of absorption by this route. The collecting lymphatics of the visceral pleura, which are the same as for the superficial parts of the lung, communicate with the deeper intrapulmonary vessels which follow bronchi, arteries and veins toward the hilum. A proof of the ready absorption by the intrapleural route has been the detection by the patients of the codliver-oil odor in their breath. *Technique:* Pure codliver oil has been employed, also that diluted to 10 or 50 per cent strength in olive oil. A quarter of an hour before injection an ampule of 0.01 gm. of morphine is administered, or *Pantopon*, combined with 3 or 4 cc. of camphorated oil, to diminish the violence of the immediate reaction. The needle is then introduced, as in giving a therapeutic pneumothorax, and 250 to 300 cc. of sterilized air are first injected. The syringe is then connected, and doses of codliver oil in 2, 5, 10 or 20-cc. amounts are injected. Usually the injections were given at weekly intervals. After a variable time the opposite side was treated, allowing two weeks to two months of rest between. Observations are reported on 8 cases, with temperature records, blood counts, and other significant findings. *Immediate Effects:* These appear within about a quarter of an hour and consist of (1) pain, sharp in character, beginning near the site of injection and finally localizing at the base, and shallow and accelerated respiration, and (2) nausea, pallor, sweats, and weak pulse. The entire reaction is over in a quarter to a half-hour, but some pleural sensitiveness persists. When an exudate already exists this reaction is not noted. On injecting the opposite pleura the same syndrome recurs. In every case, by the third day an exudate is discoverable, of albuminous character and highly eosinophilic. No microörganisms could be discovered. This exudate is always accompanied by a general febrile reaction, the degree of which varies. After such an oleomorrhuothorax the sputum always increases, usually after two or three days. These facts seem to point to a pulmonary focal reaction, such as noted by Rogers in the leprous treated by morrhuates and chaulmoogra oil. *Late Effects:* After the subsidence of this reaction there is constitutional amelioration, but the pulmonary symptoms and signs persist. As all of the patients had advanced bilateral lesions, however, striking changes could scarcely be expected. One of the first group of 5 died, 2 left the hospital improved and are being followed, and 2 are still under observation. The impression was gained that the treatment was of benefit, and that the lesions tended to become stabilized.—*Effets des injections intrapleurales d'huile de foie de morue chez les tuberculeux pulmonaires, F. Bezançon, A. Jacquelin and E. Etchégoin, Section d'études scientifiques de l'Oeuvre de la Tuberculose, June 12, 1926, reported in Rev. d. l. Tuberc., August, 1926, vii, 653.—(A. P.)*

Lipasotherapy in Pulmonary Tuberculosis.—It is an established fact that in pulmonary tuberculosis and leprosy the blood lipases are diminished. To increase the lipolytic power of the blood various observers have used many substances. A 25 per cent solution in olive oil of ethyl morrhuate was used in the treatment of 15 patients suffering from pulmonary tuberculosis in various stages. This form of therapy, because it is innocuous, is indicated in all types of pulmonary tuberculosis. Best results were obtained in the chronic fibrocaseous forms. The drug had a pronounced cardiotonic effect. In many cases with persistent tachycardia the pulse-rate was reduced to nearly normal. After the fourth or fifth dose its antithermic properties became manifest. Cough and expectoration increased at first and gradually lessened during the treatment. After prolonged use of the preparation, improvement in the lesions themselves and in the patients' general condition was observed. Five patients with tuberculosis in the cachectic stage showed a symptomatic and psychical amelioration following lipasotherapy. No ill effects were noted in any of the treated cases. The drug may be given by subcutaneous, intramuscular or intratracheal injection. The initial dose of 2 cc. of the 25 per cent solution may be increased to 4 cc. every second or third day after the first few administrations. The duration of the treatment depends upon the individual case. The cardiotonic and antithermic properties of the drug amply justify its use in all cases

of pulmonary tuberculosis.—*Lipasotherapie dans la tuberculose pulmonaire, G. C. Trumbull, Prog. Méd., April 9, 1927, no. 15, 562.*—(*U. E. Z.*)

Treatment of Pulmonary Tuberculosis with Insulin.—The use of insulin in cases of undernutrition rests on good theoretical grounds, and its application in tuberculosis is logical. It was used in 6 female patients who had had marked anorexia for a considerable time and great loss of weight. They were ambulant and usually afebrile; five of them had chronic pulmonary tuberculosis and the other one was without clinical signs of the disease. The appetite improved immediately upon administration of the drug in all the cases, and in five a satisfactory gain in weight occurred (about 1 kg. per week). Patients were put on a diet of 4,000 calories per day. Forty-eight doses, ranging from 12 to 54 units were given, each patient having an optimal dose. The treatment was carried out for four or five weeks with an occasional intermission. The improvement was still apparent in some of the patients from three to five months after discontinuance of the treatment.—*Zur Insulinmastkur bei Tuberkulose, R. I. Lepskaja and L. M. Rochlin, Deutsche med. Wchnschr., March 25, 1927, liii, 527.*—(*H. S. W.*)

Hypertonic Dextrose Solutions in Tuberculosis.—Favorable results were obtained from the intravenous injection of hypertonic dextrose solutions in functional cardiac conditions in tuberculous individuals. Thirty to 100 cc. of a 30 to 50 per cent solution was given every 4 to 5 days. Especially suited for this sort of treatment were the chronic stationary or slowly progressive cases, in which the extent of cardiac symptoms stood in no definite relation to the normal or subfebrile temperature. Contraindications were staphylomycoses and the presence of marked accumulations of pus, as empyemas. As a vehicle for other medicaments the injection of hypertonic dextrose solution was also recommended. The author combines it satisfactorily with digitalis and strophantin.—*Über intravenöse Injektionen hypertonischer Traubenzuckerlösungen und ihre Verwendung bei chronischen Infektionen, hauptsächlich Tuberkulose, H. Bodmer, Ztschr. f. Tuberk., 1926, xlvi, 283.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis with "Dilaudid."—In the treatment of tuberculosis, morphine has a very important place, especially in the late stages of the disease. The cough, especially that of the distressing, spasmodic type, which often in itself causes pain, the sense of apprehension, respiratory difficulty, restlessness, and other symptoms require a narcotic. But upon administering morphia we know that increasingly larger doses will be required. Experience has demonstrated that not all the derivatives of morphine lead to such a tolerance, and one of these has finally been elaborated which yields very desirable results. *Dilaudin* (Knoll A.-G.) is a morphine-derivative in which the molecule containing the alcoholic hydroxyl group is replaced by a keto group. It is nearer to morphine in pharmacological action than codeine is. In a series of patients it was found that at the end of five to seven weeks its action on the respiratory centre remained the same as at the beginning without increase of dosage, while morphine is without effect at the end of four weeks of daily administration unless the dose is increased. To patients in the second and third stages of the disease this new drug may be given in doses of from 0.2 to 0.4 cgm. three times a day for weeks without the necessity of increasing the dose. It alleviates pain, allays anxiety, relieves restlessness, and cough and lessens expectoration. In other words, its clinical effect on the patient is very similar to that of morphine. (It is apparently given hypodermatically just as morphine is.) It has also been used in one case of spontaneous pneumothorax and in one patient in whom there was a great deal of pain for a long time after a thoracoplasty. In two cases of caseous pneumonia, oral administration of the drug was without effect, but hyperdermatic application produced an effect upon the respiratory centre.—*Ueber die Verwendung von Dilaudid bei Lungen-Tuberkulose, E. Paulsen, Deutsche med. Wchnschr., September 2, 1927, liii, 1516.*—(*H. S. W.*)

Opotherapy in Tuberculosis.—The most valuable agents in the metabolic treatment of tuberculosis are liver extracts, lipoids, calcium, and agents capable of causing calcium fixation. For regulating female germinative function mammary-gland extracts may be used. They may be used on an anabolitic basis in males. In the treatment of the anaemia of tuberculosis, spleen and bone-marrow extracts are superior to iron preparations. Spleen and bone-marrow extracts are also useful as antitoxic agents.—*L'opoterapia nella tubercolosi, G. Breccia, Tubercolosi, January, 1927, xix, 15.*—(*U. E. Z.*)

Organotherapy of Tuberculosis.—In Germany it has become a dogma that the only immunity to tuberculosis that can be produced is that associated with living tubercle bacilli. But recently Calmette, Sanger and others have revived the belief, once current, that dead tubercle bacilli or nonpathogenic acid-fast bacilli confer immunity. It has been shown that organic extracts (for example, of spleen from tuberculous and from normal guinea pigs) exercise a remarkable effect on the virulence of tubercle bacilli. Numerous guinea pigs were inoculated intraperitoneally with virulent human tubercle bacilli which had been subjected to an extract of spleen and thymus gland and incubated for four weeks at 37°C. Bacilli were added in the amount of 1 mgm. to 10 cc. of the extract. None of the animals developed tuberculosis. Rabbits were next given several doses of splenic extract, followed by the intravenous inoculation of 0.001 mgm. of virulent human tubercle bacilli, and this was followed by intravenous treatments with the extracts that contained attenuated bacilli. Autopsy revealed no tuberculosis in the rabbits, except occasionally, whereas the normal control animals died of tuberculosis. The extracts were proved to be harmless to human beings and, when injected into a "small group" of severe cases of tuberculosis, produced beneficial results.—*Ueber Immunisierungsversuche und organotherapeutische Bestrebungen gegen Tuberkulose, G. Schroeder, Deutsche med. Wchnschr., June 10, 1927, liii, 993.*—(*H. S. W.*)

Prognosis of Pulmonary Tuberculosis.—People constantly speak of the "cure of tuberculosis." If by this is meant apparent and momentary recovery, well enough; if, however, a durable cure is meant, it must be admitted that, despite sanatoria and artificial pneumothorax, this "most curable of chronic diseases" still takes a frightful toll of mortality among those it strikes down. Two recent statistical studies of note, those of Guinard and of Naveau, bear this out. Guinard sought to determine the ultimate fate of the patients who passed through the Sanatorium of Bligny between 1903 and 1913. He found that 63 per cent of them were dead after five years and 75 per cent at the end of ten years. He devised a peculiar classification, as follows: (1) constantly bacillary *BC*, (2) intermittently bacillary, *BI*, and (3) "bacillaires de signature," *BS*, the latter term referring to those who only exceptionally showed bacilli on the routine three weeks' examination of the sputum. The mortality figures showed the following:

	BC	*BI*	*BS*
	per cent	*per cent*	*per cent*
Percentage dead at end of:			
3 years	73	29	18
5 years	84	44	29
10 years	91	58	42

This clearly indicates the importance of the bacilli in the sputum in prognosis. Patients showing habitually many bacilli are nearly all dead within ten years, while the other categories show a mortality of 40 to 60 per cent. Naveau studied the results of artificial pneumothorax among patients in the service of Rist at the Hospital Laennec at Paris. Pissavy recapitulates Naveau's figures after the elimination of patients insufficiently long observed. As Naveau terminated his investigation on May 1, 1924, Pissavy selected, for a three years' follow-up, patients to whom pneumothorax had been given, tried or proposed before May, 1921, for the five years' follow-up, those before May, 1919, and for the ten years' follow-up those before May, 1914. This, of course, gives an unequal number of patients in the different categories. *Summary:* A patient treated by artificial pneumothorax in a hospital service has 45 chances in 100 of being dead at the end of three years, 51 in 100 at the end of five years, and 71 in 100 of being dead after ten years. A patient in whom pneumothorax is clinically indicated but it cannot be administered has 70 chances in 100 of being dead after three years, 72 in 100 after five years, and 94 in 100 after ten years. At a glance one sees the good effects of pneumothorax manifest, but also that these are less striking after the first few years. Again the term "clinical cure" used by Naveau can mean only apparent cure. The conclusions reached from all the above figures are that the average truly bacillary patient has only a 50 per cent chance of survival after ten years if slightly affected, and 30 per cent if more severely affected and capable of being treated by pneumothorax. All others will almost surely be dead at the end of this period. In view of this grave outlook, common sense would indicate prevention of the outbreak of tuberculosis, or the early treatment of the predisposed and suspected. In many cases manifest tuberculosis is preceded by a premonitory phase whose indefinite symptomatology can only arouse suspicion. Whether the impairment of the general condition preceding manifest disease is the expression of the disease itself, or merely of a state of anergy favorable to its development, matters little. These are the patients

who, properly managed, respond, and in whom one can really effectively combat the tuberculosis plague.—*Le pronostic de la tuberculose pulmonaire, A. Pissavy, Presse Méd., January 9, 1926, no. 3, 35.*—(*A. P.*)

Prognostic Value of Repeated Sputum Examinations.—This study is based on statistics gathered in 1923–1924 and covering 831 patients at Bligny Sanatorium who were positive on admission during the years 1903 to 1913. At Bligny the sputum is examined every three weeks, the same interval as that for weighing the patient. A numerical scale, analogous to that of Gaffky, is employed for charting the number of bacilli. Tabulations have been made on the following basis: *1:* "Constantly bacillary," *BC*, when tubercle bacilli are constantly found on repeated examinations. *2:* "Intermittently bacillary," *BI*, when they are sometimes present, sometimes absent. *3:* "Bacillaires de signature," *BS*, when they are only present on rare occasions. Of the "constantly bacillary" there remained alive in 1924 only 48 of 401 subjects, or 4.49 per cent; of the "intermittently bacillary" 61 of 250, or 24.4 per cent; of the "bacillaires de signature" 48 of 113, or 42.47 per cent. Curves were plotted, covering twelve years from 1911–1912 to 1924. They show a striking early mortality among the "constantly bacillary," not so marked in the "intermittently bacillary," and still less in the "bacillaires de signature." After about the seventh year the increase in mortality is slight for all groups. A study was also made of 653 "clinically unilateral cases." Among these, of the "constantly bacillary," 17 per cent survived, of the "intermittently bacillary" 44 per cent, and of the "bacillaires de signature" 57 per cent. This is a better showing than that of the bilateral cases. Methods of indirect examination have not been used routinely Their value would be diagnostic rather than prognostic, and their need is infrequent. An exception might be made in the case of examination of the feces in certain patients with typical signs, who fail to furnish sputum. A more elaborate classification has also been presented, based primarily on sputum findings: (1) those constantly showing considerable numbers of bacilli, (2) those constantly showing bacilli in small numbers, (3) intermittently positive, (4) rarely positive, or positive only with special methods, (5) negative, but with signs pointing to pulmonary tuberculosis, (6) signs of probable pulmonary tuberculosis without sputum, (7) positive cutireactors only and (8) totally negative. This last category comprises not more than 3 to 5 per cent of persons over 15 living in civilized countries. *Practical Considerations:* Bacillary subjects demand prompt treatment and also isolation. Although Guinard's figures show that by 1923–1924 there had died 82 to 85 per cent of patients followed from 1903–1913, the future of such cases appears less grave with the prompt employment of therapeutic pneumothorax in suitable cases. The persistence of tubercle bacilli, especially if numerous in the sputum, should always suggest the consideration of such intervention. The intermittently bacillary cases, on the other hand, will often respond well to sufficiently prolonged treatment, but too often the necessity of working cuts short their cure. Antituberculosis organizations should realize that repeated sputum examinations can increase their usefulness. Too often indigent persons with negative sputum are allowed to occupy sanatorium beds, when most of them could be simply followed and controlled by the dispensaries. The disposition of individual cases, however, requires consideration at the same time of the results of stethoscopic and roentgenographic examination, together with the clinical history. Among sputum-negative cases requiring sanatorium supervision and care, are convalescents from recent pleurisy, for about two months after the decline of the acute symptoms. *Conclusions: 1:* The number of years of survival of tuberculous subjects is usually inversely proportional to the number of positive sputum findings of tubercle bacilli. *2:* Absence of expectoration is only of value if one can exclude the possibility of sputum having been swallowed, as by examining the feces. *3:* Repeated "bacilloscopy" is a distinct aid in the surveillance and aftercare of tuberculous patients. *4:* The importance accorded other well recognized diagnostic and prognostic criteria is in no way lessened.—*De la valeur prognostique de la bacilloscopie repétée, U. Guinard, Rev. d. l. Tuberc., June, 1926, vii, 396.*—(*A. P.*)

Key to Abstractors

A. P.: Andrew Peters, Pittsfield, Mass.
B. H. D.: Bruce H. Douglas, Northville, Mich.
B. T. McM.: B. T. McMahon, Loomis, N. Y.
E. H. K.: E. H. Kerper, Loomis, N. Y.
E. R. L.: Esmond R. Long, Chicago, Ill.
G. L. L.: G. L. Leslie, Detroit, Mich.
H. J. C.: H. J. Corper, Denver, Col.
H. M. R.: H. McL. Riggins, Loomis, N. Y.
H. S. W.: H. S. Willis, Baltimore, Md.
M. P.: Max Pinner, Northville, Mich.
U. E. Z.: U. E. Zambarano, Providence, R. I.
W. I. W.: Walter I. Werner, Northville, Mich.